DOCUMENTATION, ANALYSIS, AND INTERPRETATION OF
THE INTERIOR FINISHES OF FRANK LLOYD WRIGHT'S HELLER HOUSE

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INTRODUCTION

Frank Lloyd Wright is quite possibly the most widely known and most studied of American architects. Though innumerable aspects of Wright's architecture have been analyzed and interpreted, interior architectural finishes specified by Wright have received significantly less study. It is known that Wright often chose to specify all aspects of his designs, including interior furnishings, so it not surprising that the finishes he recommended were an equally important component of entire commissions. Preservation and restoration of Wright's buildings must begin with a sound understanding of his design concepts and the realization of his architectural theories. The materials used within these buildings are sometimes lost due to their ephemeral nature. Alteration and degradation of finishes can be caused by damage from light, soiling, temperature, moisture, and biogrowth. Often original finishes have been concealed by later finish layers or they have been removed entirely.

Groups such as the Frank Lloyd Wright Building Conservancy have made it their mission to protect and preserve Wright-designed buildings. Though many Wright buildings have been saved, few have had their original finishes fully documented and analyzed. At this stage, it is important to build a database of the interior finishes and finishing techniques Wright employed throughout his career. The current owners of the Isidore Heller House (completed in 1897), Judith Bromley

and Serafino Garella, have requested that the interior finishes be investigated and interpreted for their property, one of Wright's significant early designs.

With documentation and analysis, one can identify original and subsequent interior finishes of the Heller House, including wall and ceiling paint colors, plaster types and composition, and wood finishes. Finish studies also aid in providing evidence for chronology of later additions. With this information, the original finishes chosen by Wright for the Hellers can be interpreted and put into a context within the realm of Frank Lloyd Wright's interior design ideas. They can also be interpreted within the context of American architecture and design at the turn of the century.

CHAPTER 1 FRANK LLOYD WRIGHT AND THE HELLER HOUSE

Figure 1.1 Isidore Heller House, East façade, 5132 Woodlawn Avenue, Chicago. Photograph by the author, 1999.

1.1 Description of the Heller House

The Heller House, completed in 1897 by Frank Lloyd Wright, is located at 5132 Woodlawn Avenue on the south side of Chicago. This area is known as Hyde Park, and encompasses the campus of the University of Chicago and Wright's famous Robie House of 1907. The Heller House is an example of Wright's work in the years just after leaving the office of Louis Sullivan. He was only twenty-nine when he designed the house and was still at the beginning of his architectural design experimentations.

In the Heller House, Wright designed a house to conform to the restraints of a deep but fairly narrow city lot. The majority of the exterior of the house is executed in buff and gray Roman brick; the first story is composed of buff-colored brick while the second story includes both buff and gray brick. (Figure 1.1.) Mortar joints are buff colored in the vertical and gray in the horizontal, emphasizing the horizontality of the design. Unique features of the Heller house exterior include the third story sculptural frieze of draped female figures by Richard Bock, a well-known Chicago sculptor. The figures were modeled after Wright's design for the title page of *The Eve of St. Agnes* which was published in 1896. The design of the winged Beaux Arts female figures was simplified slightly in the translation from the title page to the Heller House frieze, probably due to the nature of the material, which was hand-modeled and cast plaster.[1] (Figure 1.7.) It is in this exterior detail that the influence of Louis Sullivan can best be seen.

The House possesses a "monitor" roof, wherein a third story is added above the main eaves of the house which is smaller than the other stories and capped with its own hipped roof. The main entrance along the south façade is a square-headed opening ornamented with Romanesque columns at each side, surmounted by a paneled motif that is described as a vaguely Arabic design.[2]

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[1] David A. Hanks, *The Decorative Designs of Frank Lloyd Wright* (New York: E. P. Dutton, 1979), 170. Here Hanks incorrectly described the Heller frieze writing that it was of terrra cotta.
[2] Grant Carpenter Manson, *Frank Lloyd Wright to1910: the First Golden Age* (New York: Van Nostrand Reinhold Co., 1958), 171.

(Figure 2.) Above the entrance is a piazza, embellished with a row of elaborate plaster colonettes supporting the deep cornice and the third story.[3] (Figure 6.)

Figure 1.2 Entrance to the Heller House, South elevation.
The loggia is visible on the second level.
Photograph by the author, 1999.

The overall appearance of the house from the street is rather simple and severe with its neutral colored bricks, and basic geometries. Upon closer inspection, the austere street façade unfolds with the concentrated elaborate details of the Romanesque columns of the entry, the frieze of maidens, and the beautifully colonnaded second-story loggia.

[3] Grant Carpenter Manson, *Frank Lloyd Wright to 1910: The First Golden Age* (New York: Van Nostrand Reinhold, 1958), 76.

The approach to the house is by a stepped terrace that runs perpendicular to Woodlawn Avenue. The entrance, described above, is at 90 degrees to the body of the house intersecting it at its midpoint.[4] The Heller House is an example of what is called Wright's "in-line house", in which the living room is situated on one side and the dining and service areas are on the other with a stair hall in between. Other examples of the "in-line house" include the McAfee house of 1894 and the Husser House of 1899.[5] (Figure 1.3.)

The Heller House plan has also been described as an "I plan" of interlocking spaces. The living room has a north-south orientation that crosses the long rectangle of the primary east-west axis through the entry hallway to the dining room.[6] The dining room maintains the east-west orientation but is offset south of the primary axis. The space draws one from the entry to the larger living and dining quarters.[7] The Heller House interior features a fine example of Frank Lloyd Wright's early art glass windows of the totally abstract type in the main stairwell, compared to the conventionalized flowers or plants that came later in his window designs.[8]

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[4] Paul Laseu and James Tice, *Frank Lloyd Wright: Between Principle and Form* (New York: Van Nostrand Reinhold, 1992), 76.
[5] Ibid.
[6] Henry-Russell Hitchcock, *In The Nature of Materials* (New York: Da Capo Press, Inc, 1942), 28.
[7] William Allen Storrer, *The Architecture of Frank Lloyd Wright: A Complete Catalog* (Cambridge, Massachusetts: MIT Press, 1974), 38.
[8] David Hanks, *The Decorative Designs of Frank Lloyd Wright* (New York: E.P. Dutton, 1979), 54.

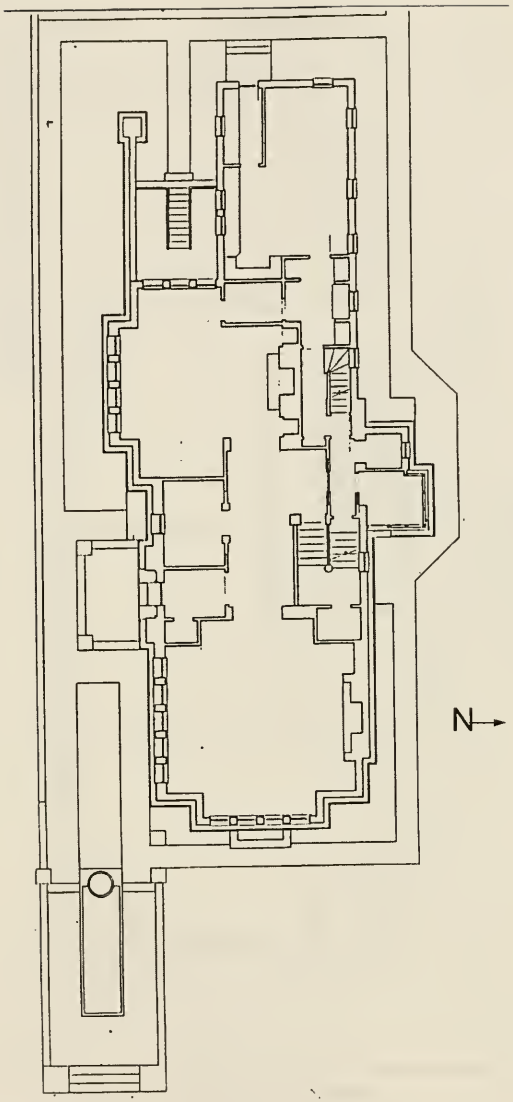

Figure 1.3 First Floor Plan of the Heller House
Courtesy ofJohn Vinci Architects.

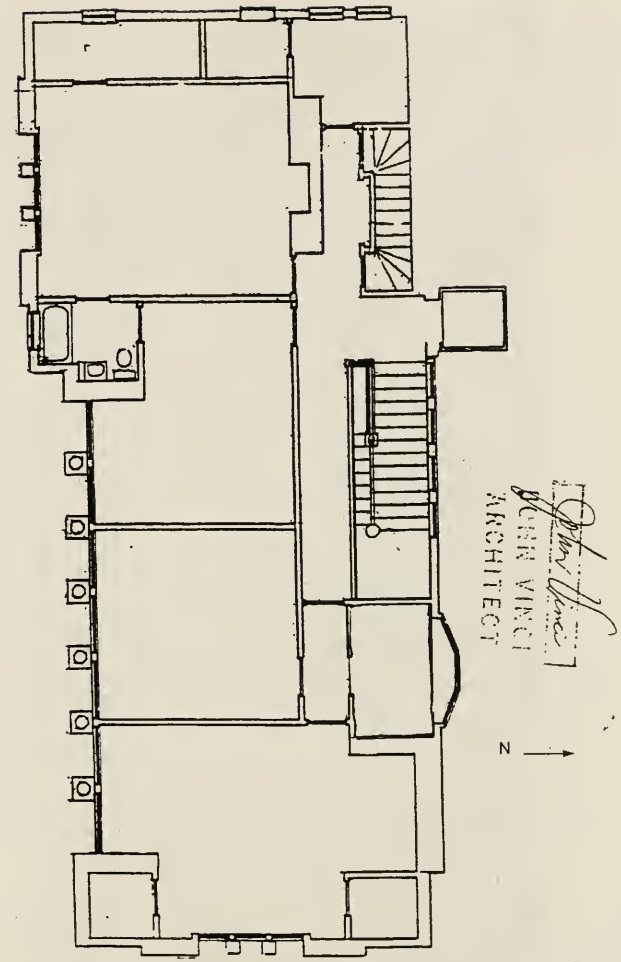

Figure 1.4 Second Floor Plan of the Heller House
Courtesy of John Vinci Architects.

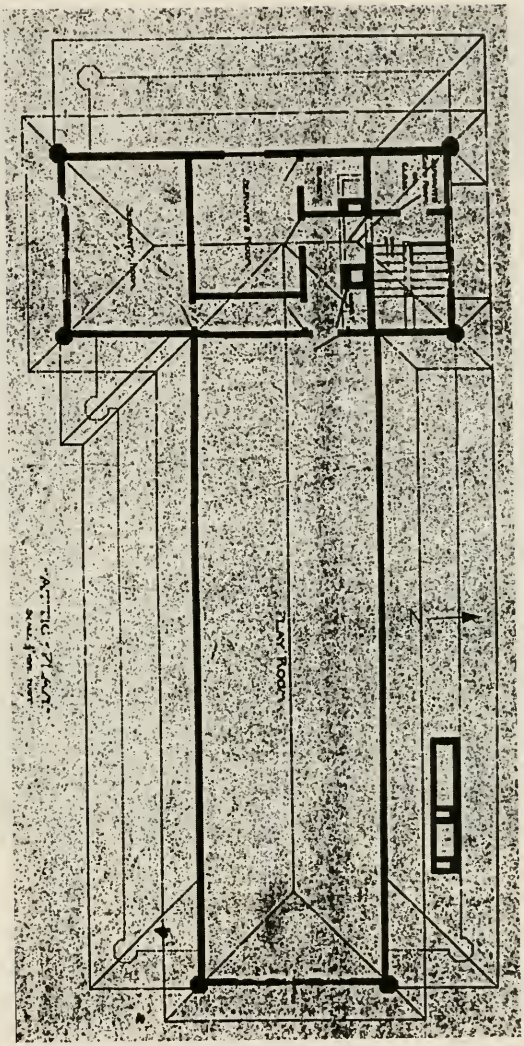

Figure 1.5 Third Floor Plan of the Heller House From the Frank Lloyd Wright Archives.

Figure 1.6 Colonette on the third story.
Courtesy of Judith Bromley, 1999.

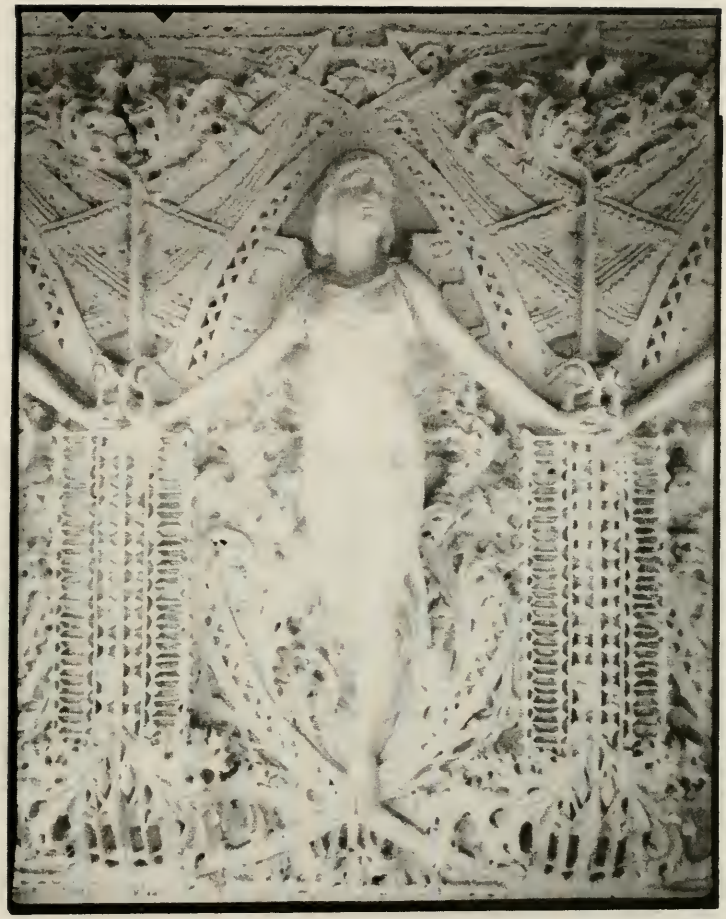

**Figure 1.7 Detail of the maiden from the Heller House Frieze.
Sculpted by Richard Bock, 1897.
Photograph Courtesy of Judith Bromley, 1998.**

The Heller House interior was originally trimmed in quarter-sawn oak.[9] The primary rooms on the first floor - the drawing room, dining room, and hall - have oak woodwork that frames the ceiling and wall spaces. The windows on the first floor are one-over-one sash finished in a dark green paint on the interior. The living room has a brick fireplace framed in oak, and built-in bookcases with delicate filigree work on their sides. Wright's original drawing included brass light standards that were subsequently removed but the outlines of the bases remain on the floor in the living room.[10] (Figure 1.8.)

Figure 1.8 North side of drawing room where fire place and wood bands are visible. Photograph by the author, 1999.

[9] See Heller House drawing, figure 1.11.
[10] Heller House Drawing, Plate from "The Work of Frank Lloyd Wright" Architectural Review 7 (1905), plate 22.

The entry vestibule of the house was originally connected to the reception room by a door on the west, which was later filled by a large bookcase and mirror. Evidence of this alteration includes oak baseboards that do not match the original quarter-sawn oak of the rest of the house. This baseboard was placed in front of the original threshold between the two rooms.

The long, broad center hall includes the stairs to the second floor finished with closely spaced, oak balustrades. The dining room has a brick fireplace framed in oak, with open cabinets on either side and small wood columns above where light standards are set. The servants' areas--the pantry, kitchen, and back hall of the first floor --are all finished in pine. (Figures 1.9, 1.10.)

An elevator designed by Wright around 1909 was added off of the servant's hallway on the north side of the house.[11] To the east of the elevator, also off of the hallway, is a glass and wood-enclosed porch that extends northward on the property. It is not known whether the porch, all or some of its parts, is original to the house or was a later addition. It is not likely to be original because it does not appear in any of Wright's drawings of the house, though it may relate to Wright's elevator addition of 1909. (Figure 1.12.)

[11] Plans at the Frank Lloyd Wright Archives indicate the elevator addition in a different location.

Figure 1.9 Historic photograph of hall c. 1950.

Figure 1.10 Dining room north side where fireplace and cabinets are visible. Photograph by the author, 1999.

The main stairway is illuminated by large art glass widows. (Figure 1.13.) The second floor includes a long hallway leading to four bedrooms and a sewing room. The master bedroom, on the east end of the house, includes a recently restored fireplace that was discovered by the current owners during their renovation of the adjacent bathroom. (Figures 1.15, 1.16.) This fireplace shares the stack with the living room fireplace. There is another fireplace of light buff brick located in the southwest bedroom, above the dining room fireplace.

The third story of the Heller house originally had servant's bedrooms and a children's play room and now includes three bedrooms, one bathroom, a kitchen, a dining area, and a long room stretching eastward toward Woodlawn Avenue. (Figure 1.17.) The dining area was added sometime after the original construction and encompasses part of the original play room. The alterations were most likely made during the occupation of the Watsons, because their parents moved into the third story. Much of the original green paint over rough sand-float plaster remains in this story.

Very little archival information exists for the Heller House. The Frank Lloyd Wright Archives contains plans of the Heller House but many have suffered fire damage. The only known Wright correspondence relating to the Heller House are two brief letters in the collection of the Getty Research Institute Archives, written in 1939 and 1949 respectively. There was also a Historic American Building Survey done of he Heller House in 1956. The most informative document

regarding interior finishes, is a drawing of the Heller House published in *Architectural Record* in an article written by Robert Spencer in 1905 entitled, "The Work of Frank Lloyd Wright." The living room drawing includes specifications for the following interior furnishings and finishes:

> *Interior Walls of Rough Sand Finish [,] trimmed in Quartered and waxed white oak [,] plaster saturated with pure color [,] floors finish and furniture of one wood and color throughout [,] Lighting fixtures in main rooms wooden standards with globes worked in brass and opalescent glass [,] Interior color scheme bronze and dull green*[12]

Armed with this information, the investigation of the Heller House interior finishes began. (Figure 1.11.)

[12] Heller House Drawing, "The Work of Frank Lloyd Wright" *Architectural Review* 7, 1905, plate 22.

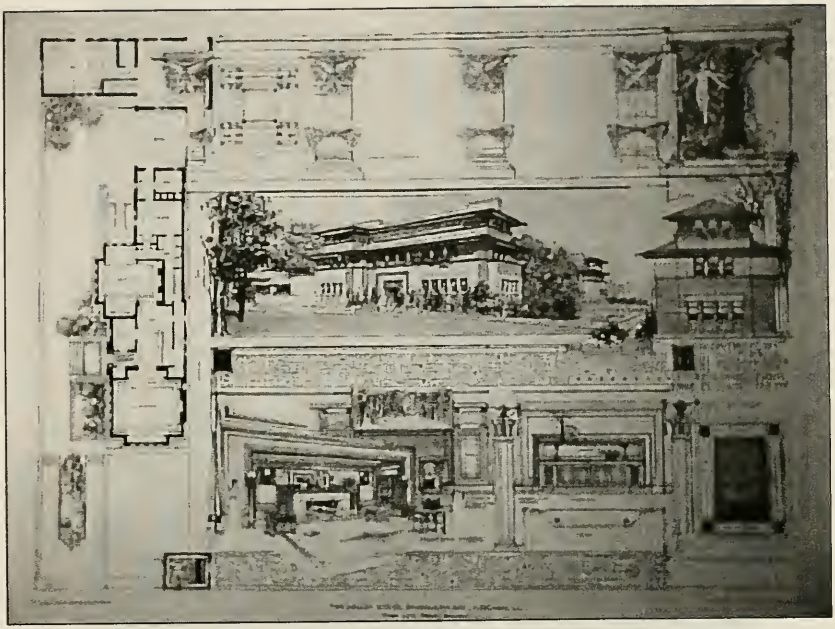

Figure 1.11 Drawing and details of the Heller House by Frank Lloyd Wright. From Robert Spencer, "The Work of Frank Lloyd Wright" 1905.

Figure 1.12 Heller House, north façade.
Porch and elevator shaft are visible. Photograph by the author, 1999.

Figure 1.13 Art glass window in stair hall, north elevation. Photograph courtesy of Judith Bromley, 1999.

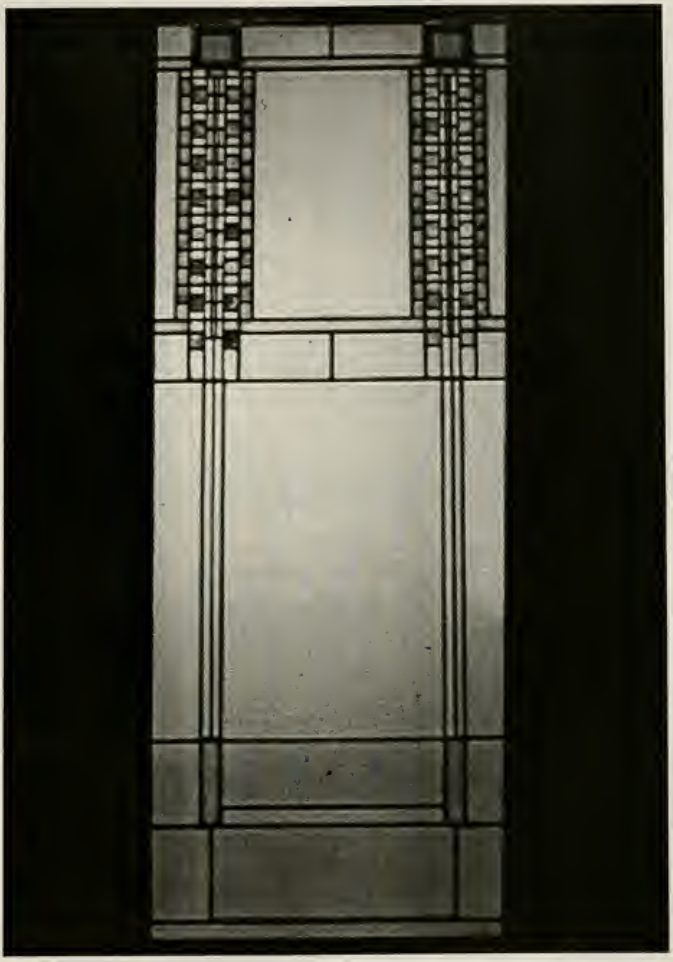

Figure 1.14 Bedroom art glass window.
Photograph courtesy of Judith Bromley, 1999.

Figure 1.15 Restored Fireplace in master bedroom.
Photograph by the author, 1999.

Figure 1.16 Master Bedroom before Fireplace was uncovered and restored.
Photograph by Judith Bromley, 1996.

Figure 1.17 Attic play room, north elevation.
A small area of the original bead board is uncovered.
Photograph courtesy of Judith Bromley.

1.2 History of the Heller House

1.2.1 Isidore and Ida Heller

In 1897 Isidore Heller commissioned Frank Lloyd Wright to design a house for his family to fit a long narrow lot in Chicago's Hyde Park neighborhood. The client, Isidore Heller, was part owner of Wolf, Sayer, and Heller Packer's and Butcher's Supplies at 212 Fulton Street, just northwest of Peoria on the northwest side of Chicago.[13]

Chicago building records in 1897 indicate a permit was issued to Heller for a three-story brick dwelling of 26 feet front, 98 feet deep, and 41 feet high on 5130 to 5132 Woodlawn Avenue. William Adams was the recorded contractor, and the estimated cost for the house was $12,000.[14]

What is known about the Heller family comes from census data and city directories. Isidore Heller was born in Austria in 1847. His wife, Ida, was born in Wisconsin in 1857. The Hellers had three children. At the time of the 1900 census, the Hellers had two servants, and in 1910, they had only one.[15] It is known that Ida Heller died on October 11, 1909 from heart disease and shock resulting from an accidental fall at home.[16] Her funeral was at the residence on

[13] See Figure A.3, A.4, 1901 Chicago City Directory, 1904 Chicago City Directory.
[14] See Figure A.5, Record of building permit for the Heller House.
[15] See Figure A.8, A.9, Census data from 1900 and 1910.
[16] See Figure A.6, Death Certificate of Ida Heller.

Woodlawn Avenue and by 1915, city directories indicated that Isidore Heller later resided in Silver Lake.[17]

1.2.2 Chain of Title

In 1895 the Hellers purchased a long narrow lot on Woodlawn Avenue from Jonas Hamburger.[18] The house was probably built in 1897, according to construction records. In 1906, twenty-five feet south of the lot was sold to him making the house lot much larger.

Following his wife's death, in 1913, Heller sold the house to Francis Bickett who within a year sold it to Charles McFarlane. In 1924, the house was acquired by Mr. And Mrs. Joseph Mayer who owned it until 1939. In 1939, the house was sold again to Wilfred Fox and his wife. After eight years, the Foxes sold the Heller house to George Watson in 1948. The Watsons owned the house for twenty-five years, which was the longest period of ownership. They eventually sold the house to Lewis Bradford in 1972. During their occupancy, the Bradfords were responsible for sandblasting the exterior of the house and also removing the original kitchen. They probably made the alterations to the third floor and may have added the exterior porch.

In 1977 the Bradfords sold the house to Victor and Danielle Barcilon who undertook exterior masonry repairs including tuckpointing and also sold some of

[17] From the 1915 Chicago City Directory obtained by Judith Bromley.

the loggia colonettes and the fretwork to various museums and dealers. After their ten-year ownership, the Barcilons sold the Heller house to David and Catherine Epstein, who in turn sold it to the current owners, Serafino Garella and Judith Bromley, in 1995.

The present owners exhibit a great deal of respect for Wright's design and unending curiosity regarding original elements of the house that are missing or have been obscured for years. In five years, they have carefully restored a bathroom, investigated original paint colors, and restored the master bedroom fireplace that had been walled up for many years.

1.3 Frank Lloyd Wright in the 1890s

After two years of engineering school at the University of Wisconsin, Wright moved to Chicago in 1887 and began working in the office of Joseph Lyman Silsbee, architect to Wright's uncle, Jenkin Lloyd Jones. The following year, Wright moved to the office of Dankmar Adler (1844-1900) and Louis Sullivan (1856-1924), where he remained until 1893. Wright's first obvious influence in the designs of the office was in the Charnley House built in 1891. A year later, Wright designed the Harlan House, which he considered to be the beginning of his own

[18] Chain of title was obtained from Judith Bromley.

practice.[19] The projecting roof line, the cantilevered balcony, and the form of the dormer were elements that would become hallmarks of Wright's architecture.[20]

While working for Sullivan, Wright was a frequent visitor to the Chicago World's Fair of 1893, where Sullivan's transport pavilion was under construction. Wright was exposed to a variety of world architecture including the Japanese Ho-o-den wooden temple, which was a replica of a temple in Japan from the Fujiwara period, the Turkish pavilion with its great overhanging roof, and photographs of Mayan Temples.[21] This early exposure to foreign design may have been a major influence upon his creativity. Shortly thereafter, Wright opened his own practice after his departure from Sullivan's office for accepting private commissions.

During the years between 1893 and the early 1900s, Wright experimented with a wide range of architectural design types and styles. Before his marriage, he shared a home with his mother in Oak Park, a suburb of Chicago. The area provided the young architect with an opportunity to create new designs. Chicago, center of the Midwest, had enjoyed unprecedented growth in the decades following the great fire in 1871. By moving to Oak Park, Wright was in the center of a rich enclave of potential clients, many of whom were self-made businessmen. Wright's clients, respecting his genius and enjoying his personality,

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[19] Donald W. Hoppen, *The Seven Ages of Frank Lloyd Wright* (Santa Barbara, California: Capra Press, 1993), 20.
[20] Hoppen, *The Seven Ages of Frank Lloyd Wright*, 20.
[21] Donald W. Hoppen, *The Seven Ages of Frank Lloyd Wright*, 14.

often recommended him to their friends and colleagues as an excellent architect.[22] Wright enjoyed many commissions in the suburbs of Oak Park and nearby River Forest. One need only walk down Forest Avenue in Oak Park to experience the variety and experimentation in Wright's commissions during his early career. During the first decade of his practice, Wright experimented with designs for new houses and methods for remodeling existing houses that illustrated innovation and change.[23] In the Heller House of 1897, Wright was approaching his own definitive style, while still borrowing from his earlier influences.

1.4 Frank Lloyd Wright and Contemporary Interior Design

Many of Wright's earliest principles of architectural design and ornamentation developed out of nineteenth-century reform ideology, broadly termed the Arts and Crafts movement in England and America. Wright espoused the movement's notions of simplicity, propriety, and honest use of materials.[24] The principles of organic beauty influenced architects and craftsmen in Chicago who were searching for a style they deemed more appropriate than that of the *Beaux Artes*, a style that captured the dignity of each citizen in a democratic republic. The Chicago Arts and Crafts Society was organized on October 22, 1897, with Wright as one of the charter members.[25] But Wright differed from his colleagues in his

[22] Donald W. Hoppen, *The Seven Ages of Frank Lloyd Wright*, 20.
[23] Grant Carpenter Manson, *Frank Lloyd Wright to 1910: The First Golden Age* (New York: Van Nostrand Reinhold Company, 1958), 71.
[24] David A. Hanks, *The Decorative Designs of Frank Lloyd Wright* (New York: E.P. Dutton, 1979), 61.
[25] Hanks, *The Decorative Designs of Frank Lloyd Wright*, 63.

willingness to abandon the handicraft ideals. He believed that the machine could be as appropriate for construction techniques as hand techniques.[26] In Wright's opinion, the artist could design simple objects that could be made by the machine.[27]

Although Wright's designs were typically unique to each commission, certain characteristic themes in his interiors have been noted. For example, in his own house in Oak Park (1889), the openings between rooms lacked traditional framing details, and were placed beneath a continuous string coarse so that sections of the wall read as panels, or screens.[28] Wright's house also illustrated his use of perimeter axes to enhance the sense of informality he sought within residential interiors. These perimeter axes were defined by such things as focal elements within the interiors, furniture arrangements, or openings between major rooms. Wright believed that the traditional, formal, central axis could not achieve the sense of informality that he desired in residential interiors.[29] By the 1920s, he employed contrasting textures of materials to define certain select areas in his interiors.[30]

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[26] Ibid., 64.
[27] Ibid., 66.
[28] David G. De Long, "The Place of Objects: Frank Lloyd Wright's Attitude Toward s Interior Design and the Decorative Arts", *Frank Lloyd Wright Newsletter*, 2, no. 3, (1979): 13.
[29] Ibid.
[30] De Long, *Frank Lloyd Wright Newsletter*, 15.

Early on, Wright used wood trim and strips to outline walls and ceilings and to integrate walls and ceiling with window and door openings; the trim often coordinated with the wood and finishes selected for the furniture.

As for Wright's color choices, it is generally - and somewhat accurately - believed that browns and other autumnal tones were often used in his early interiors. Some scholars have noted that other colors palettes were not entirely excluded.[31] In his later work, more chromatically intense colors were introduced as in the lavender and mauve used in the Hollyhock house in California of 1919-1921 and the strong reds as in Fallingwater of 1935-1937 and the Hanna House of 1937.[32]

Wright considered all parts of an interior, including the furniture and decorative arts as contributing elements. As each component in an interior is part of a larger whole, so is each room an interrelated part of the whole building. Therefore when examining a specific Wright design, the original intentions and schemes must be considered in their entirety.

[31] De Long, *The Frank Lloyd Wright Newsletter*, 15.
[32] Ibid.

CHAPTER 2 FINISH CONTEXT AND HISTORY

2.1 Finishes Analyses of Contemporary Frank Lloyd Wright Interiors

In order to better understand and interpret the interior finishes of the Heller House, research was conducted on existing studies of other Frank Lloyd Wright designs of the same period.

The analysis of architectural finishes as an academic study began in the 1970s. Since then, the techniques employed in analysis have become quite advanced. Of Wright's many surviving buildings, only a small number have been studied for their interior finishes and very few of these have been formally reported or documented. Furthermore, the techniques and depths of analysis have varied greatly. Nevertheless, it is possible to summarize general characteristics described in the studies to gather a sense of the materials and colors that Wright used during his early design years. With the survey of interior finish reports of Wright housed constructed before 1910, it is possible to gain insight into Wright's aesthetic and technical sensibilities during the Heller House era.

Robert Furhoff of Chicago has investigated and analyzed the interior finishes of many Frank Lloyd Wright buildings, including a preliminary study of the Heller House. Furhoff's reports on other Wright houses from the time period of the Heller house were consulted for comparison.[1]

[1] Robert Furhoff has generously supplied his Frank Lloyd Wright finish reports for this research.

Furhoff described his general investigative techniques as follows: during a site investigation of original finishes, Furhoff selectively extracted representative finish samples from protected areas. He examined them on site and under a stereomicroscope. Plaster, paint, and wood finish types were described and often color matching, photomicrography, solubility tests for finish characterization, and a finished report was the result. Colors were matched using the Munsell Color System that identifies color in terms of hue, value and chroma (h v/c).

F.B. Henderson House[2]

One of the earliest Wright interiors that Furhoff studied is the F.B. Henderson House (1901), located in Elmhurst, Ohio. The paint analysis of this house was completed by Furhoff in 1989. The first floor of the Henderson house had a textured sand-float plaster wall finish. On the plaster ceiling and frieze, there was a white, semi-gloss, semi-opaque sealer, over which a thin layer of paint was applied.

The original paint finish was visually determined to be casein. Furhoff characterized the paint as casein because of it semi-opaque appearance, its resistance to water, and its efflorescence with application of acid. Some of the white substrate was exposed on the ceiling and frieze in the application of the finish, so the visual effect of the interior finish was the combination of paint and

[2] From Robert Furhoff's report of 1989 on the F. B. Henderson House.

exposed plaster. There was no sealer on the walls in the Henderson House and the application of the paint was solid and opaque. Furhoff described the original paint color in the first floor as varying from light to medium yellow, depending on the translucence of the sand-float plaster.

Likewise, no sealer was used In the library and dining rooms of the Henderson House and the original finish was determined to be calcimine. The application was solid and opaque and the color was a moderate orange, matched to Munsell 5 YR/5 7.5/7. The woodwork was not studied during this investigation.

Ward W. Willits House[3]

In the Ward Willits house, (1902-1903) Highland Park, Illinois, all surfaces had a sand-float texture. The ceilings, soffits, and the living room frieze were painted in what Furhoff described as a strong yellow paint (Munsell 2.5 Y 7/9) with a brown glaze coat. The stair hall and living room walls were originally a brownish-orange color, (Munsell 7.5 YR 5.5/4.5) and the dining room walls were a green with a brown glaze (Munsell 5 GY 5.5/5). The ceiling of the stair hall was not glazed and had a "dead flat finish", described as calcimine, and its color was a strong yellow (Munsell 3.75 Y 7/10). The dining room frieze was a rich orange-brown glaze over plaster. The glaze was a strong brown varying from Munsell color 7.5 YR 4/6 to 7.5 YR 4/8. Furhoff noted that the glaze was soluble in alcohol and

[3] From Robert Furhoff's report of 1994 on the Ward W. Willits House.

could have been pure or pigmented orange shellac. Investigation of original woodwork finish was not done during this analysis.

Charles A. Brown House[4]

In the Charles A. Brown House (1907), Evanston, Illinois, all plaster surfaces had a coarse, sand-textured finish, were primed with one coat of sealer, and the finish was one coat of calcimine paint. The paint was determined to be calcimine due to its very flat finish and it solubility in water. The original finish was opaque with 100% surface coverage. Furhoff remarked that in the second floor, the treatment was more typical of nineteenth century decoration when chambers were commonly colored for the purpose of room identification. Here there was a blue room, a pink room, a gray room, and a yellow room.

The Beachey House[5]

The Beachey house (1907), Oak Park, Illinois, also had a sand-float plaster surface, but the original finish was found to have two-tone coloring. Since more pigmentation collected in the depressions of the surface, these areas had a slightly darker color with thinner pigmentation on the raised surfaces. All original finishes were described as "flat".

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[4] From Robert Furhoff's report of 1990 on the Charles A. Brown House, Evanston, Illinois.
[5] From Robert Furhoff's report of 1997 on the Beachey House, Oak Park, Illinois.

On the first floor, the ceiling and wall frieze were painted in a pale grayish-yellow (Munsell color 1.25 8/3.5). The entrance hall walls were finished in a strong yellowish brown (between Munsell color 10 YR 4/5 and 10 YR 5/5). The living room walls were a moderate olive (Munsell color 7.5 Y 4.5/2.5 to 7.5 Y 4.5/4.5). The dining room walls were a light yellowish brown (Munsell color 10 YR 7.5/6)

George C. Stockman Residence[6]

In the Dr. George C. Stockman Residence (1908), Mason City, Iowa, the walls originally had a thin coating of distemper paint over sand-float plaster. The bathroom, kitchen, and veranda originally had an oil base coat.

Here Furhoff found that the entry, living room, dining room and stair hall were originally finished in a light-yellowish-pink distemper paint (Munsell 1.25 YR 8.5 / 3/5). The kitchen and passage were finished with a sand-float plaster ceiling and smooth-finished walls, both in a yellowish-gray.

Meyer May House[7]

In the Meyer May House (1908), Grand Rapids, Michigan, the original wood finish was clear varnish on natural unstained oak with a filled grain similar in color to the natural wood. All of the plaster surfaces were again a sand-float plaster. The original finish was a very thin application of flat oil paint and all of the wall

[6] From Robert Furhoff's report of 1992 on the George C. Stockman Residence, Mason City, Iowa.
[7] From Robert Furhoff's report of 1986 on the Meyer May House, Grand Rapids, Michigan.

surfaces were stippled. The same color, a yellowish gray, was used for priming of all the surfaces. The main finish coat color schemes were yellow, browns, oranges, and grayish-yellows.

The Meyer May House also had a mural located on four sides of a pier wall between the hall and dining room that was painted with a low gloss oil paint over sand-finished plaster.

Mrs. Thomas H. Gale House[8]

In the Gale House (1909), Oak Park, Illinois, Furhoff investigated the first floor, including the entrance hall, a small room to the left of the entrance, the living room, and dining room. He found that all original finishes were calcimine paint. Original plaster type was not described in this report. The original colors were a light-purplish gray on the walls and a yellowish-white on the frieze.

George Barton House

The George Barton House located in Rochester, New York (1903) was studied by Judith J. Bischoff, Amy Meyer, and Noelle Wiedemer.[9] They found that the plaster in the Barton house was also sand-float type. Fibers were found in the

[8] From Robert Furhoff's report of 1984 on the Mrs. Thomas A. Gale House, Oak Park, Illinois.
[9] Judith J. Bischoff, "Color and material Analysis of Original Plaster Finishes in the George Barton house, Buffalo, N.Y." Bulletin: *The Quarterly Newsletter of the Frank Lloyd Wright Building Conservancy* 8, no. 3 (Summer 1999): 12.

plaster undercoat and were identified as either horse or cattle hair, which was a common additive in plaster for the purpose of increased durability.

The analysts noted that during Wright's Prairie period, staining or finishing plaster with a glaze was the preferred technique. Also, distemper or kalsomine paint was commonly used in the nineteenth and early twentieth centuries. However, in the Barton House, there was evidence of beeswax and linseed oil in the infrared spectra of all of the original paint surfaces. In fact, in Wright's specifications, he specified "one coat of transparent finish brushed on, composed of equal parts by volume of melted beeswax, turpentine, and linseed oil tinted with oil pigments". The record of Wright's specifications is a clear indication that he chose customized finishes in the Barton House. The investigators did not find precedent for the use of such a medium on domestic interior plaster walls. The exact method of application of the material is unknown and was impossible for the analysts to uncover with their samples.[10]

Heurtley House[11]

The paint restoration of the Arthur Heurtley house (1902) Oak Park, Illinois, was undertaken by a painter and contractor named Doug Pherickson. Pherickson found that in some of the areas of the Heurtley house, the original sand-float plaster was covered over by a later 1/8 inch thick smooth plaster layer.

[10] Bischoff, *Bulletin: The Quarterly Newsletter of the Frank Lloyd Wright Building Conservancy*,13.
[11] Information regarding Heurtley House finishes from telephone interview with Doug Pherickson, October 17,1999.

Replication of the original plaster finish was difficult and in order to get the correct sand for the finish, a mason's sand was sieved and the largest particle size was used for the plaster finish.

Pherickson mechanically removed intervening layers of paint to uncover the original paint layers. He found the original layers of paint to be water soluble, probably calcimine, though no testing was done for binder identification. Pherickson described the original finish as "dead and flat."[12] He found that the original finishes were not monochrome, but two to three colors were used over the sand-finished plaster. For example, the living room ceiling had a bright turquoise as the base paint coat with an ochre layer over it. Pherickson described that the original was "the color of a deerskin jacket."[13] The dining room had a complex three-colored finish on its upper walls, with a van dyke brown, an ochre, and a turquoise green.

In the restoration of the Heurtley house the painters used alkyd paints. Pherickson admits there is a difference since the original calcimine was "dead flat," but the felt that the original colors could be accurately replicated. The process involved painting on the first coat of paint and then letting it dry. Then the second coat was added and the rubbed off with rags to allow some of the first color to show through.

[12] Doug Pherickson, Telephone Interview, 17 October 1999.
[13] Doug Pherickson, Telephone Interview, 17 October 1999.

Summary of interior finishes analyses

Information regarding a number of Frank Lloyd Wright Houses that have been investigated for interior finishes has not been acquired, mostly due to the fact only one of these reports of the period before 1910 has been published (Judith Bischoff's report on the George Barton House). With few exceptions, those with knowledge of original Wright finishes have been difficult to contact for interviews within the time constraints of the study.

From these reports, certain characteristics emerge in Wright's finishes during his pre-1910 period. These include the common use of sand-float plaster either throughout the house or only in select rooms; the use of water-based and transparent flat finishes including distemper and calcimine; the occasional use of oil–based finishes, especially in rooms of a utilitarian nature such as kitchens; and a color palette that including yellows, oranges and browns, but not excluding brighter colors such as turquoise, pink, and blue.

[13] Doug Pherickson, Telephone Interview, 17 October 1999.

Table 2.1 Pre-1910 Wright Interior Finishes

House Name	Date	Investigated by	Plaster Type	Finish Type	Predominant Colors
Henderson House Elmhurst, Ohio	1901	Robert Furhoff 1989	Sand-float	Semi-gloss semi opaque sealer ceiling and frieze- casein walls -calcimine	Yellow Orange
Arthur Heurtley House Oak Park, Ill.	1902	Doug Pherickson	Sand-float	calcimine	Ochre Green Turquoise
Ward W. Willits House Highland Park, Illinois	1902-1903	Robert Furhoff 1994	Sand-float	Flat Calcimine glaze	Yellow, Yellow-green, Brown, Light olive
George Barton House Rochester, NY	1903	Judith Bischoff 1999	Sand-float	Beeswax and linseed oil with oil pigments	Yellow-brown Olive green Bright yellow
Charles A. Brown House Evanston, Illinois	1907	Robert Furhoff 1990	Sand-float	Clear primer Calcimine paint	
Beachey House Oak Park, Illinois	1907	Robert Furhoff 1997	Sand-float	Flat finish	Gray-yellow, Strong yellow-brown, olive,
George C. Stockman Residence Mason City, Iowa	1908	Robert Furhoff 1992	Sand-float	Distemper Oil based paint	Yellow-pink Yellow-gray
Meyer May Grand Rapids, Michigan	1908	Robert Furhoff 1986	Sand-float	Thin layer of oil paint, stippled walls	Yellow Brown, orange
Mrs. Thomas H. Gale House Oak Park, Illinois	1909	Robert Furhoff 1984		Calcimine	Purple-gray Yellow-white

2.2 Interior Design Literature of the Heller House Period

A survey of period literature related to trends and recommendations for interior finishes is helpful in placing Wright's choices for the Heller House in the context the time. A selection of primary sources including *The House Beautiful* were used for information regarding design trends of the period. Also, journals such as *The Decorator and Furnisher* and *Painting and Decorating* provided valuable advice for finish techniques, trends, and materials to both professionals and homeowners. Additionally, the publication of *The Craftsman*, by Gustav Stickley provided valuable sources for specific interior design theories that were advocated in the early twentieth century as part of the arts and crafts ideals.

These sources suggested the treatment of interior surfaces depended upon the amount of light and the location of the room.[14] Wall treatment was considered to be of the utmost importance in decorating and the choice of wall color determined the floors, curtains and furniture.[15] Candace Wheeler wrote in *Principles of Home Decoration* that the ceiling's influence upon the beauty of the average house was so small, its treatment was a comparatively easy problem, "although greater restfulness of effect is believed to be produced, it was not an invariable rule that the ceiling should carry the same tint as the wall."[16] It was acceptable for the ceiling to represent light of sky and to be the lightest tone of

[14] "Decoration of Hallways" *The Decorator and Furnisher* 15, no. 5 (February 189): 153.
[15] "Color in House Interiors" *Painting and Decorating* 9 (1893): 416.
[16] Candace Wheeler, *Principles of Home Decoration*, (New York: Doubleday, Page & Co., 1912),122.

gradation in the room.[17] Also, the ceiling could be cream white, a colour believed to harmonized well with almost any color walls, and producing the effect of air and light in the room.[18] Among proponents of the arts and crafts movement, ceilings were generally downplayed.

Wheeler believed that the true principle of wall treatment is to make the boundary stand for color and beauty, and not alone for division of space."[19] She commented that, " Variation, produced by minute differences, which affect each other and which the eye blends into a general tone, produce quality."[20] Various means of achieving variations are described, including placing paint upon rough plaster, "so that the small inequalities of surface give light and shadows as in textiles: upon such surfaces a pleasant tint in flat colour is always good."[21] "This matter of variation without contrast in wall-surface is one of the most important in house decoration."[22]

Volumes of *The House Beautiful* were consulted between the years of 1897 and 1905.[23] Many of the colonial revival houses featured in this publication in the early years of this century advocated the use of decorative wallpapers and the

[17] "Color in House Interiors" *Painting and Decorating* 9 (1893): 416.
[18] Wheeler, *Principles of Home Decoration*, 123.
[19] Wheeler, *Principles of Home Decoration*, 89.
[20] Wheeler, *Principles of Home Decoration*, 110.
[21] Wheeler, *Principles of Home Decoration*, 111.
[22] Wheeler, *Principles of Home Decoration*, 112.
[23] The House Beautiful began publication in 1897.

practice of painting woodwork white.[24] These practices were especially prevalent in Colonial Revival interiors. A modern house in Cambridge, Massachusetts had a large hall faced with two-tone green wallpaper with ivory woodwork and a highly polished floor. The Living room walls were hung in a decorative French paper with a rhythmic design. The large and well-lit bedrooms were hung with rose-colored paper patterned with bouquets of flowers.[25]

It was recommended that there be harmony and blending of colors where rooms are all open together. In a large house in New York state in 1900, the parlor was papered in a soft buff color, the hall was hung in a terra cotta color, and the dining room had a large figured paper in brown tones.[26]

In a home in Lake Forest, Illinois, the halls were hung in a wallpaper of yellow, with the woodwork painted white. Wallpaper was used throughout the house. For example, the library walls were hung in a soft green paper.[27] A reception room in a house in Elyria, Ohio, had gray papered walls with a floral border in yellow and red. The same house had burnt orange grass cloth on the dining room walls with white painted woodwork.[28] In a house in Seattle, the library walls were hung in a Pomeiian red ingrain wallpaper and the woodwork was stained a dark green.[29] In

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[24] Ruth B. Creech, *A Study of Color and Color Fashions in Selected Interiors from 1901 to 1964 Presented by House and Garden Magazine*, (Masters Thesis in Home Economics, Drexel University1964), 7.
[25] "Successful Houses." *The House Beautiful* 7 (1901): 97.
[26] "Some House Beautiful Decorations" *The House Beautiful*, 7 (1901): 355.
[27] "Successful Houses." *The House Beautiful* 8 (1901): 266.
[28] "More House Beautiful Suggestions in Practice." *The House Beautiful* 13 (1904): 236.
[29] "Successful Houses." *The House Beautiful* 12 (1903): 168.

a home in Buena Park, Chicago the reception room was hung with wallpaper in soft blues and greens. The living room walls were decorated with a green striped wallpaper. [30]

Other journalists with discounted the value and beauty of wallpapers. It was believed by some to be an inferior material because it imitated decorative painting.[31] There was still some concern for the toxicity of wallpapers, since arsenic had been used.[32] Also paint was revered as a more truthful material to arts and crafts advocates, and was believed to be handsome, durable, and easily cleansed. Specifically, kalsomine was believed to be an inexpensive a healthful wall covering.[33] A description of frank Lloyd Wright's own house in Oak Park, Illinois, was published in 1897 in *The House Beautiful.* The color treatment in three first story rooms was a dark color dado, a light green ceiling, and sheepskin-colored walls. The library also included overlaid gold designs on the green dado. The walls and ceiling in the dining room were covered in golden brown arras.[34]

In addition to paint, wood paneling was also recommended. In an article entitled "*Interior Walls*" Judith Chafee wrote that " wallpapers are inferior as a wall decoration to any form or treatment, however simple, that maintains instead of

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[30] "A House for All the Year." *The House Beautiful* 14(1904): 329.
[31] "What Shall We Do With Our Walls?" *House Painting and Decorating* 1 (1885): 6.
[32] "Why Walls Should Be Painted." *House Painting and Decorating* 1 (1885): 214.
[33] "Why Walls Should Be Painted." *House Painting and Decorating* 1 (1885): 215.
[34] "Successful Houses." *The House Beautiful* 3 (February 1997): 65-66.

effaces the architectural lines of a room. From the decorative point of view, there can be no comparison between the flat meanderings of wall paper pattern and the strong architectural lines of any scheme of paneling, however simple."[35] These opinions echo the Arts and Crafts beliefs of the time.

Gustav Stickley believed that the treatment of wall spaces "is the keynote not only of the whole character of the house, but of the people who live in it."[36] He maintained that the most important feature of wall spaces was the woodwork which should never be painted or stained, and that the "friendly" quality of the wood should always be apparent[37]

Stickley also valued the characteristics of sand-finished plaster. "The rough texture of the plaster has the effect of seeming to radiate color, while it absorbs the light instead of reflecting it as from a smoothly polished surface."[38] In terms of color treatment, he believed that "when the color is put on lightly enough to be as trifle uneven instead of a solid hue without variation of a any sort, there is a chance for the sparkle and play of light which at once adds life and interest."

Above is a sampling of the varying opinions related to finish choices during the Heller House period. While some were advocating the use of decorative

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[35] Judith Chafee, "Interior Walls" *The House Beautiful* 12 (1903): 214.
[36] Gustav Stickley, *Craftsman Homes* (New York: Dover Publications, Inc. 1979), 144.
[37] Gustav Stickley, *Craftsman Homes* (New York: Dover Publications, Inc., 1979), 146.
[38] Gustav Stckley, *Craftsman Homes* (New York: Dover Publications, Inc., 1979), 147.

wallpapers, more commercially available after the 1840s, others felt that wallpaper was a false substitute for other finishes. Color choices varied greatly, and were usually very specific to room use. The idea of treating the house as a continuous space began to come into fashion, where colors were similar or the same from one room to the other. Stickley believed in the honest use of materials such as wood and textured plaster, ideas that Wright himself subscribed to.

2.3 Finish Literature of the Heller House Period

2.3.1 Paint

Paint is "a mechanical mixture or dispersion of pigments or other colorants in a liquid or vehicle."[39] The vehicle usually consists of the binding medium and a thinner. When paints are applied, the thinner evaporates and the binder forms a solid film that holds the pigments fixed in place.[40]

In "The Elementary Components of Paint" an article in *House Painting and Decorating* in 1885, the function of paint is explained that "Paint serves a twofold purpose- viz. to protect and preserve the material to which it is applied, and to render the object more pleasing."[41]

[39] *Manual on the Selection and Use of Paints*, (Ottawa: National Research Council of Canada, 1950), 1.
[40] Theodore Zuk Penn, "Decorative and protective Finishes, 175-1850" *Association for the Preservation of Technology* 16, no. 1 (1984): 3.
[41] "The Elementary Components of Paint" *House Painting and Decorating* 1 (1885): 113.

Distemper and Other Water-based House Paints

A survey of paint literature from the turn of the century reveals a variety of definitions, descriptions, and recipes for distemper and other water-soluble paints.

The term "distemper" is rather vague and unclear because there are different types of distemper paints. In America, for example, the word mainly was used for glue distempers, while in England the term was applied more broadly to other types of water-based paints, including those bound by casein.[42]

In *Carpentry and Building* magazine (1887), distemper was defined simply as "A paint made with a water-soluble adhesive or glue binder."[43]

In *the Expert Calciminer* (1920), the author describes distemper as

> *A paint made from pigments diluted with water, to which some adhesive substance is added to fix it to the ground on which it is used."*[44]

In *House Painting and Decorating* (1885) distemper is described in terms of its preparation as

> *a whiting and jellied size made into a paste and then melted to a clear liquid that will turn to a yellow unless a little blue or black*

[42] Morgan W. Phillips, " A Victorian Trompe L'Oeil" in *Paint in America*, Roger W. Moss, ed., 156.
[43] Theodore Zuk Penn,"Decorative and Protective Finishes, 1750-1850", *APT Journal* 16, no. 1 (1984): 25.
[44] A. Ashmun Kelly, *The Expert Calciminer*, 2nd edition, (1920), 126.

pigment is added. In applying the wash care should be taken to stop all draughts. The painter should face the light so that his hand and arm should not shadow the end of each stroke. Care must be taken to have no patches requiring to be gone over. The moment the job is finished, the air should be freely admitted.[45]

According to period sources, the term distemper was often used interchangeably with the term calcimine and they were often believed to be superior to oil and lead paint in the clearness and delicacy of its tints. In *The Expert Calciminer*, the author explains that Calcimine or distemper:

> *Does not discolor from age as oil paint does, but holds its tints and colors perfectly for years, unless dampness is present, in which case water paint deteriorates rapidly. Calcimine is easily washed off.*[46]

In 1908, Paul Hasluk wrote in *House Decoration* that:

> *In America, wall colouring in Distemper is called kalsomining and is best done when the walls are neither cold nor very hot.*

Hasluk then provided a recipe for the preparation of white kalsomine:

> *10 lbs. Best whiting (calcium carbonate)*
> *1 ½ lbs. White glue*
> *½ lb. Alum*
> *and a little ultramarine blue*
> *Put the glue to soak for 12 hrs in cold water and then set it on fire and stir until dissolved. Put ½ gallon cold water over the whiting and when dissolved, add the glue, the blue, and the alum which must have been dissolved in hot water. Stir well, strain through a sieve.*[47]

An article entitled "Kalsomining" from *Painting and Decorating* (1892) described the preparation of the mixing of kalsomine:

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[45] "Distempering" *House Painting and Decorating* 1, (1885-1886): 266.
[46] Kelley, *The Expert Calciminer*, 186.
[47] Paul N. Hasluk, *House Decoration* (Caseell & Co., Ltd., 1908), 99.

Always begin by mixing up the whiting in water to the consistency of thin mush. Strike the tint before adding the glue. Glue should be soaked at least one hour in cold water before being cooked. It is ready for use as soon as it is dissolved by heat. By soaking the glue in water, the full benefit of the binder is obtained.
The first coat may be applied hot, but the second coat as cold as possible.
In tinting walls always use earth or natural colors, because the lime in the walls affect a number of the chemical colors and causes the work to look streaky. [48]

For the coloring of distemper, it was advised that:

All pigments should be mixed with the whiting before the size was added and should be either ground very fine or should be washed as to ensure the most minute division of particles.[49]

The most useful and ordinary pigments for staining whiting are: for warm tints-Venetian and Indian reds and burnt sienna
For buffs and cinnamons- natural ochres, umbers and siennas with the above reds
For blue and grey-lime blue and ultramarine
For French grey-lime blue and ultramarine with red
Where neutral is required-blue black or Paris black
For greens-raw sienna or ochre with lime blue, indigo, or ultramarine
Dark colours seldom require whiting[50]

According to one recent author, calcimine's "oldest and perhaps most proper meaning is commercially-prepared distemper paint and that in the twentieth century, the term "has referred to both glue distemper paints and paints containing casein as all or part of the binder".[51]

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[48] Arthur S. Barbier, "Kalsomining," *Painting and Decorating* 7, no. 12: 1119-1120.
[49] Hasluk, *House Decoration*, 101.
[50] Hasluk, *House Decoration*, 102.
[51] Morgan Phillips, in *Paint in America* (Washington, D.C.: National trust for Historic Preservation, 1994), 156.

The binder in distemper was most often a type of glue, but was not limited to this as explained in *The Expert Calciminer*:

> *Binders used in water paints such as calcimine and other distempers included animal glue, vegetable glue, fish glue, gelatin, waterglass (silicate of soda), casein, flour, starch, molasses or syrup, dextrin, gum tragacanth, sugar, milk, honey, Iceland and Irish moss, glucose, and gum shellac.*[52]

Some general properties and advantages of calcimine were recently described in the *Old-House Journal Compendium*:

> *Calcimine paint was used commonly in America from the early 18th century until the early part of the 20th century. It is a water-based wash often mixed right on the job from whiting, or chalk, glue size, water, and pigment.*[53] *Calcimine was popular because it could be made inexpensively with common materials and was attractive because of its soft, lustrous, flat finish.*[54] *It is very different than the effect from oil-based or latex paints. A drawback noted for calcimine paints is that layer on top of layer of calcimine tends to crack and peel. It was advised to always wash off the old calcimine before painting again.*[55]

In *The Expert Calciminer*, instructions are given for calcimining a sand-finished wall:

> *If the walls are new and clean, and in good condition, one coat of calcimine will give the perfect finishes when the sand-finish is not obscured with too much calcimine. When a sand-finished wall is in the right condition, it will need no size. A sand finished wall requires a heavier brush such as the heavy German pattern.*[56]

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[52] A. Ashmun Kelly, *The Expert Calciminer*, (A. Ashmun Kelly, 1920), 90.
[53] Clem Labine, ed., *The Old-House Journal Compendium*, (Woodstock, New York: The Overlook Press, 1980), 174.
[54] Ibid.
[55] Labine, ed., The Old House Journal Compendium, 175.
[56] Kelly, *The Expert Calciminer*, 6.

In addition to period literature, some commercially prepared paint cards of the late-nineteenth and early-twentieth centuries were examined at the Athenæum of Philadelphia. On the following pages are some examples of commercially prepared calcimine and distemper paints. (Figures 2.1-2.4.)

From the paint definitions and descriptions above, it seems that the terms calcimine and distemper were used somewhat interchangeably. Subtle differences might lie in proportions of glue or other binder, proportions of whiting or calcium carbonate, and whether or not they were hand mixed or commercially prepared.

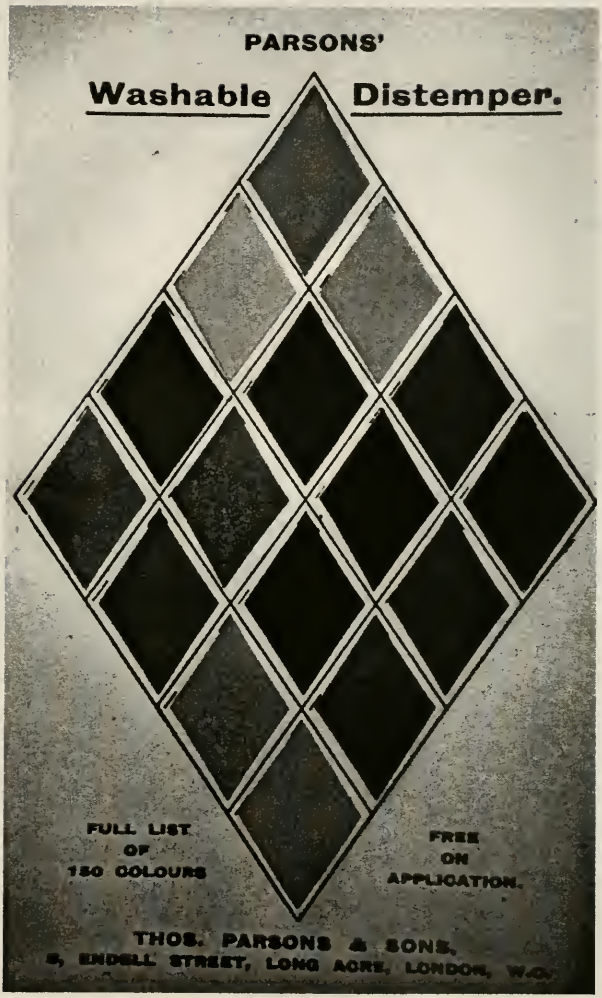

Figure 2.1 Parson's Washable Distemper Paint Card, 1908. From the Athenæum Philadelphia.

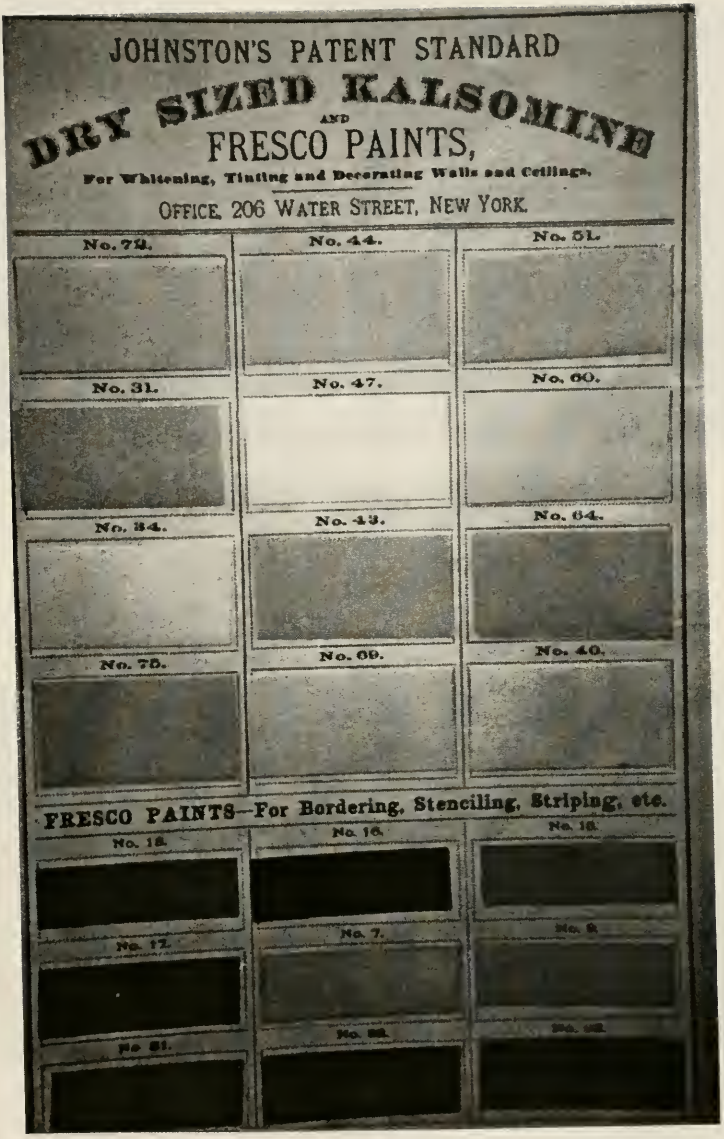

Figure 2.2 Johnston's Patent Kalsomine and Fresco Paints, 1890. From the Athenaeum of Philadelphia.

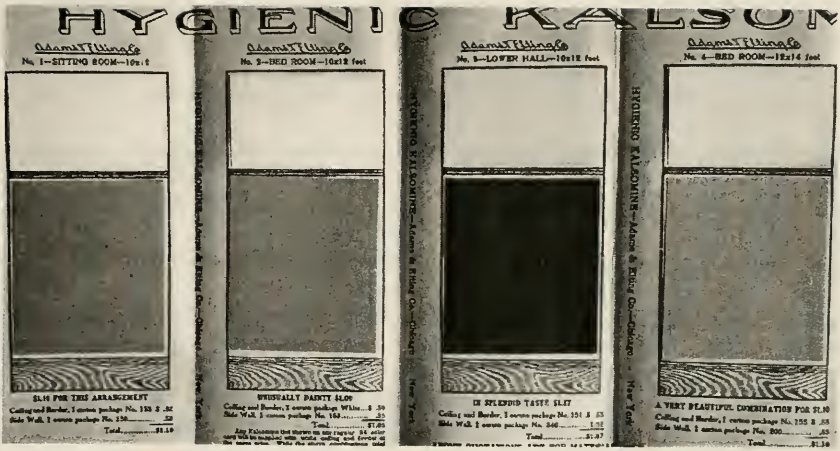

Figure 2.3 Adams and Elting Co. Hygienic Kalsomine, 1909. From the Athenæum of Philadelphia.

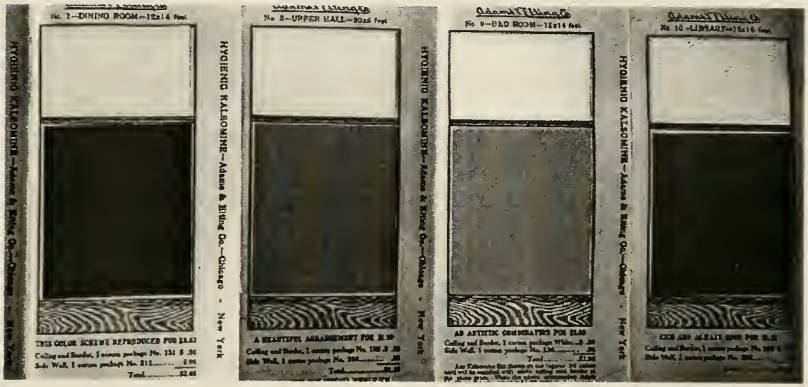

Figure 2.4 Adams and Elting Co. Hygienic Kalsomine, 1909. From the Athenæum of Philadelphia.

2.3.2 Wood finishes

As noted above, the advocates of the colonial revival in the late-nineteenth century recommended white paint as a wood finish. However, others, especially proponents of the Arts and Crafts movement, advocated letting the natural quality of the wood prevail. As early as 1875, F.B. Gardner wrote in *How to Paint*, "The custom of finishing houses with beautiful woods, instead of with paint, is a very tasteful one, and we are glad to notice that it is rapidly growing in favor with the public."[57] In the House beautiful one writer in 1900 wrote about the beauty and truthfulness in materials of Japanese domestic architecture. He wrote that the Japanese handle wood, "with a fineness of feeling that at best we (Americans) reveal only when we are dealing with precious marbles....and anything that may obscure the beauty of texture and grain is rigidly kept away."

Additionally, Gustav Stickley advocated wood as a priority in interiors. For finishing quarter-sawn oak, the wood used in the Heller house, he recommended applying several coats of floor for a satin finish.[58]

[57] F.B. Gardner, *How to Paint* (New York: S.R.Wells, 1875), 118.
[58] Gustav Stickley, *The Best of Craftsman Homes* (Santa Barbara, California: Peregrine Smith, 1979) 224.

2.3.3 Sand-float Plaster

Description

Sand float plaster or a float finish is a term denoting a plaster finish used when a surface texture is desired. Many Frank Lloyd Wright buildings include plaster surfaces with sand-float finishes.[59] Many other turn of the century houses had sand-float finishes.[60] The coarseness of the float finish depends on the type of aggregate, the proportions of the mixture, and the type of float used. The texture of a float finish results from the action of aggregate particles disturbed by the moving float tool on the surface. The float is a tool used to glide over the surface of the plaster to fill voids and hollow spaces and to level any irregularities. It is also used to compact the plaster material depending on the pressure applied by the plasterer. Additionally, a float can be used to impart texture to a finish plaster.[61]

Appication

For the application of the float finish, it is recommended that the base coat over which the plaster is applied be uniformly damp. The plasterer, with a brush in one hand, applies water to the surface while the float in his other hand moves in a circular motion immediately behind the brush. It is common practice in more recent years that a surface be floated two times; first a "rough floating" with a

[59] Frank S. Welsh, "Frank Lloyd Wright's Use of Wax at Wingspread," *Bulletin: the Quarterly Newsletter of the Frank Lloyd Wright Building Conservancy* 10, no. 1 (Winter 2000): 16.
[60] From Report by Robert Furhoff on the Emery Zusag house (1902), Walter Burly Griffin architect.
[61] John R. Diehl, *Manual of Lathing and Plastering*, (New York: Mac Publishers Association, 1960), 118.

wooden float, that is followed immediately by a final application with a rubber float.[62]

Standard Recipes

To provide information regarding the preparation method for sand-float finishes, some standard proportions for finish coat float finishes mixed on-site is given below:

> *2 parts lime putty: 1 ½ parts Keene's cement: 4 ½ parts sand by volume*
> *1 part dry hydrate lime putty: 1 ½ parts gypsum gauging plaster: 2.3 parts sand by weight*
> *2 parts dry hydrate lime putty: 1 part Portland cement: 2.5 parts sand by weight*
> *1 part lime putty: 3 parts sand by volume*
> *1 part gypsum neat plaster: 2 parts sand by weight*[63]

[62] John R. Diehl, *Manual of Lathing and Plastering* (New York: Mac Publishers Association, 1960), 118.
[63] Diehl, *Manual of Lathing and Plastering*, 94.

CHAPTER 3 SITE INVESTIGATION TECHNIQUES

A site visit was made to the Heller House on November 18 to 20, 1999 in order to photograph, document, and sample the interior. Selected finish samples were taken for analysis to the Architectural Conservation Laboratory at the University of Pennsylvania. Each room in the house was assigned a number in order to organize the sample collection and documentation. (Figures 3.1-3.3.) Essential information was recorded on the site data sheets during the visit. (Figure 3.4, 3.5.)

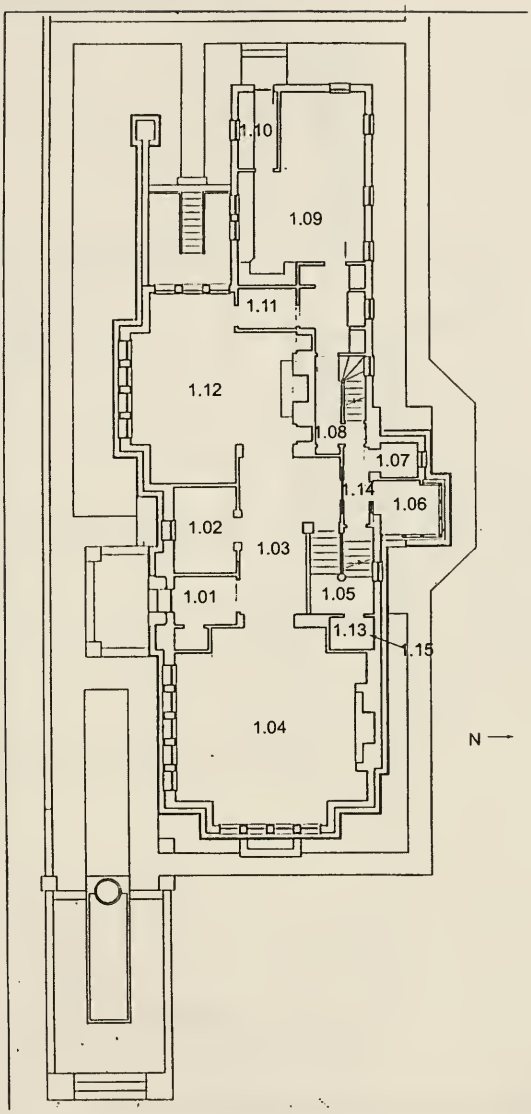

Figure 3.1 Heller House First Floor Plan with room numbers

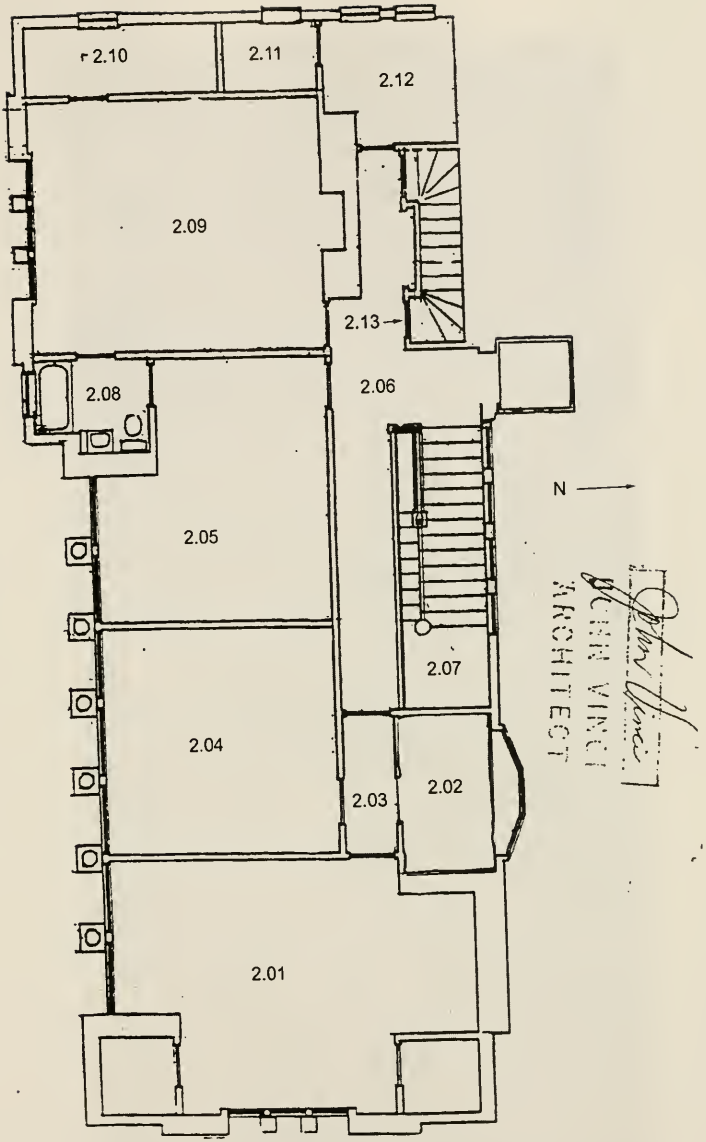

Figure 3.2 **Heller House Second Floor Plan with room numbers**

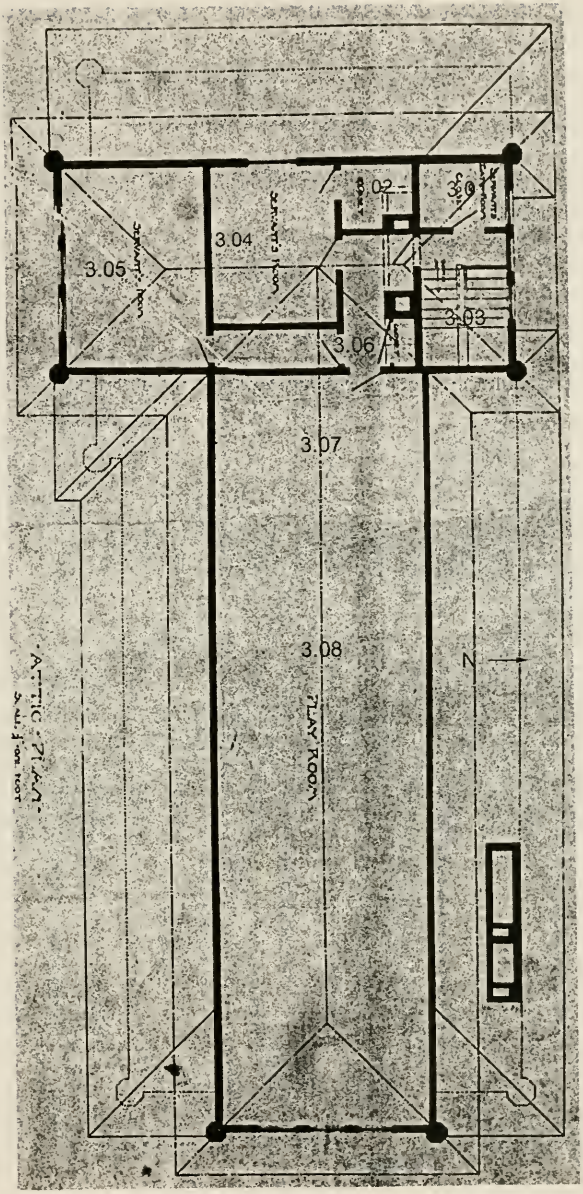

Figure 3.3 Heller House Third Floor Plan with room numbers

3.1 Archival and Site Documentation

Written documentation of the Heller House was an essential part of the project. The rooms were systematically inventoried using the room documentation form below in order to account for all significant existing components and their modification over time.

HELLER HOUSE
Room Description

Room name: VESTIBULE   Room number: 101

Floor description: Oak, matched narrow board, 2¼" wide, has been sanded & refinished

Wall description: rough plaster, have canvas painted in coral/orange color, including closet, green color evidenced by drips (after 1948)

Ceiling description: rough plaster

Woodwork: Dark stained oak, baseboard 18", trim 5½" baseboard on west side (near mirror) not quarter sawn oak

Doors: Front door - glazed single pane w/ modern iron grill, Double door into hall, originally a door on west into reception rm, since closed, mirror there now Double door w/ glass

Windows: none

Hardware: brass handles

Other features: closet on west side, crawlspace door at closet top

Room History/Owner information: J.B. says door into reception was enclosed before 1948

Figure 3.4 Room description sheet used during site visit

Photographic documentation of the Heller House was also carried out to supplement the written descriptions.

HELLER HOUSE
INTERIOR FINISHES

ZANA WOLF
UNIVERSITY OF PENNSYLVANIA

PHOTO LOG

FILM:
DATE:

FRAME	LOCATION	COMMENTS/ SIGNIFICANCE
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
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25		

Figure 3.5 Photo log used during site visit

3.2 Finish Investigation and Sampling

Investigation of the interior finishes began with a background discussion with the owners. Judith Bromley pointed out specific information about the finishes that was in turn used as a guide in the sample investigation. For example, Bromley explained her own investigations, recommended locations in the house that she believed had original fabric, and indicated areas of particular interest to her. Each space in the house was investigated to determine discreet areas where original finishes could be removed as the house is currently occupied and is finished. Each sample number and location was keyed on the Heller House plan. For example sample 1.01-1 is the first sample taken form the vestibule on the first floor with 1.01 being the room number and 1 being the sample number. Sample numbering started at one in each new room investigated. (Table 3.1)

A variety of sample types were taken during the investigation. The primary goal of the site investigation was to uncover and identify original finishes rather than to sample blindly. Sample types included protected painted plaster for original extant finishes, samples with subsequent overpaint layers, original plaster, protected wood from underneath hardware, and wood window sash samples for the original window finishes.[1]

[1] A full list if samples taken is on the following page. All samples were taken by Zana Wolf unless otherwise noted with initials for Frank Matero (F.G.M) or Robert Furhoff (R.F.).

Table 3.1 Heller House Finish Sample List

Sample #	Room Name	Sample Material	Sample Location
1.01-1	vestibule	Builder's paper	Behind top of mirror, west wall
1.01-2	vestibule	plaster	Behind wooden frame of mirror, west wall
1.01-3	vestibule	canvas	Above mirror, behind wood molding, west wall
1.01-4	Vestibule	Wood	Top of baseboard to east of double doors
1.01-5	Vestibule	Plaster and paint	Closet, above baseboard, north side
1.01-6	Vestibule	Plaster and paint	Closet, behind baseboard, west side
1.02-1	Reception	Wood	Behind switch plate on pillar, north side
1.02-2	Reception	Wood	Window sash above handle, south wall
1.02-3	Reception	Canvas and paint	Behind radiator, north wall
1.02-4	Reception	Plaster and paint	Above entry, north wall, near east corner
1.03-1	Hall	Wood	West door of double doors into vestibule, behind hardware plate
1.03-2	Hall	Painted plaster	East wall, behind baseboard, protected drip
1.03-3	Hall	Wood molding	East wall, near 1.03-2
1.03-4	Hall	Painted plaster	Behind switch plate, south wall, near dining room
1.03-5	Hall	Painted plaster	Behind switch plate, south wall, near living room
1.04-1	Living Room	Painted plaster	Original finish, drop ceiling, near south east corner, where light fixture removed
1.04-2	Living Room	Wood	Window sash, under hardware
1.04-3	Living Room	Canvas	West bookcase near south side of room
1.04-4	Living Room	Wood	Window sash, unprotected, second bay from west, south wall
1.04-5	Living Room	Painted plaster	Behind wall light sconce (R. F.)
1.04-6	Living Room	Painted plaster	Strip between wood moldings (R.F.)
1.04-7	Living Room	Painted plaster, canvas	Transition between wall corner and ceiling banding (R.F.)
1.04-8	Living Room	Painted plaster	South bay ceiling (R.F.)
1.04-9	Living Room	Paint	New metallic gold paint used in room
1.04-10	Living Room	Canvas	Canvas layer over original paint
1.06-1	Porch	Wood	Window frame, south door sidelight (FGM)
1.06-2	Porch	Plaster	Transom panel above door, south side (F.G.M)
1.06-3	Porch	Wood	Enframement, south door (F.G.M.)

1.06-4	Porch	Wood	Bottom fascia board below window sill, east wall (F.G.M.)
1.06-5	Porch	Wood	Transom bead on hinge, bottom, frame east (F.G.M.)
1.06-6	Porch	Wood	Casement window frame (fixed) on East wall (F.G.M.)
1.06-7	Porch	Wood	Beaded board ceiling, under gypboard over plaster (F.G.M.)
1.06-8	Porch	Wood	Window stile (F.G.M.)
1.06-9	Porch	Wood	Screen door stop, porch exterior, over door (F.G.M)
1.06-10	Porch	Wood	Exterior porch, original art glass stile (F.G.M.)
1.06-11	Porch	Wood	Storm casement, exterior (F.G.M.)
1.06-12	Porch	Wood	Exterior door frame under screen door step (F.G.M.)
1.08-1	Servant Hall	Plaster	Corner of baseboard and trim, north wall, by basement
1.08-2	Servant Hall	Wood	Threshold between 1.08 and 1.14
1.08-3	Servant Hall	Wood	Double door pine behind hardware
1.08-4	Servant hall	Plaster	South wall, behind radiator
1.08-5	Servant Hall	Plaster	Inside closet east wall
1.09-1	Kitchen	Plaster	Next to door in Servant hall
1.09-2	Kitchen	Wood	East window sash, bottom right corner
1.09-3	Servant's dining room	Plaster	Near baseboard, northwest corner
1.09-4	Servant's Dining Room	Plaster	South wall (J. B.)
1.11-1	Pantry	Plaster	Next to door to kitchen, behind new baseboard, west wall
1.11-2	Pantry	Wood	Sliding window of pantry furniture, exterior side
1.11-3	Pantry	Wood	Pantry window, exposed area
1.12-1	Dining Room	Plaster	Behind switch plate, east wall, between hall and alcove
1.12-2	Dining Room	Wood	Alcove, north side, wood trim
1.12-3	Dining Room	Wood	Loose piece from floor, Southwest corner
1.12-4	Dining Room	Paint	From window sash, closet to pantry, west wall
1.12-5	Dining Room	Plaster	Alcove, between two wood trims/strips, south wall
1.13-1	Telephone room	Canvas	Wall field, north wall
1.13-2	Telephone Room	Plaster	Wall field, east wall
1.14-1	Hall, behind stair	Wood	Exterior side bathroom door, under hardware
1.14-2	Hall, behind stair	Plaster	North wall, next to elevator and porch, behind baseboard
1.14-3	Hall, behind stair	Plaster	South wall, above glass window

1.14-4	Hall, behind stair	Plaster	North wall, above elevator
1.15	Bathroom	Plaster	North wall, by stair, under rail
2.01-1	Master Bedroom	Wood	Exterior window stile sample, south wall
2.01-2	Master Bedroom	Plaster	East wall, south east corner, by baseboard
2.04-1	Bedroom	Plaster	South wall, to east of radiator
2.05-1	Bedroom	Plaster	North wall, cracked plaster
2.05-2	Bedroom	Wood	Window, exterior sash, south wall
2.05-3	Bedroom	Plaster	Wall field, cracked plaster, east wall
2.05-4	Bedroom	Plaster	West wall, above baseboard, where separation occurs
2.06-1	Hall	Plaster	West wall, next to 2.09, behind peeled canvas, above baseboard
2.06-2	Hall	Wood	Baseboard, west wall
2.06-3	Hall	Plaster, canvas	Between windows, in stairway
2.08-1	Bathroom	Plaster	North wall, where canvas removed
2.09-1	Bedroom	Plaster	South wall, by baseboard, near east corner
2.10-1	Dressing room	Plaster	Above rail, next to built in, west wall
2.11-1	Closet	Plaster	West wall, above baseboard
2.11-2	Closet	Plaster	East wall, above first rail
2.12-1	Sewing room	Plaster	East wall, where it is pulled away
2.12-2	Sewing room	Plaster	South wall, above baseboard
2.13-1	Closet	Plaster	North wall
3.01-1	Bathroom	Wood	Casement window sash, interior
3.03-1	Hall and stair	Plaster	Below window
3.07-1	Dining Room	Wood	Beaded board inside cabinet
3.07-2	Dining Room	Wood	Exterior door of cabinet
3.07-3	Dining Room	Wood	Wall field west wall by baseboard
3.07-4	Dining Room	Wood	Baseboard on south side
3.08-1	Play Room	Wood	East wall, wood trim around window
3.08-2	Play Room	Wood	Ceiling joist south end, western joist
3.08-3	Play Room	Wood	Behind wall paper south wall, by radiator

CHAPTER 4 ANALYTICAL TECHNIQUES

A variety of analytical techniques were employed to analyze the finishes in the Heller House. Analysis included paint stratigraphy documentation, original finish color investigation, finish classification, pigment identification, and plaster classification. Techniques ranged from visible light microscopy for identification and documentation of paint layers, to instrumental techniques including scanning electron microscopy (SEM) with energy dispersive X-ray analysis and electron dot mapping for confirmation of pigments and infrared spectroscopy (FTIR) for the identification of paint binders. Each technique and its use in the Heller House samples is described below.

4.1 Paint Layer Documentation

Finish samples were inspected under a Nikon stereomicroscope. Samples having potential original finish information were chosen for further cross-sectional examination and analysis. To view a sample clearly in cross section, the sample was mounted in a polyester resin, Bioplast®. Two parallel cross sectional cuts were made through the mounted sample with a slow-cutting diamond blade Isomet® saw. The cross section was then sanded and polished for clearer viewing under the microscope.

Over 100 sections were prepared from the Heller House samples; in some cases several sections were made from a single sample because it provided various

information. Many painted plaster samples provided no information regarding the original room finishes, but were useful for determining subsequent paint layers. A paint layer stratigraphy sheet was developed and used for the documentation of each sample. (Figure 4.1, 4.2.) This enabled as much information as possible through microscopy to be recorded. This sheet was especially valuable for recording and describing all the layers that were visible. Taken together, the samples gave a chronology of original and subsequent paint layers. (Photomicrographs of the sample cross-sections are located in Appendix B, pages 137-169.)

The most important layer for focused study was the original paint layer. In those samples retaining original paint, the layers were visibly different in composition and texture, and obviously quite different from subsequent paint layers. In the original paint layers, groups of pigments were often easily isolated under the microscope because the samples were so densely pigmented.

HELLER HOUSE
Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Site: Heller House, Chicago, Illinois

Sample Number: L62-2 A Room: reception

Sample Location: Window, south wall, sash, east side

Sample removed by: ZW Date of removal: 11/9/99

Sample examined by: ZW Date of examination: 1/12/00

Information regarding sample: looking for original sash color

Magnification: X10 Mounted or unmounted sample: Mounted

Sample Substrate: wood

Photomicrograph: Yes Film: 200 Fuji Photograph number: 17

	STRATIGRAPHY	COMMENTS
1.	wood	substrate
2.	yellow	primer
3.	medium/dark green	paint
4.	white	1-3 layers of paint
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary: green appears original

Figure 4.1 Sample stratigraphy sheet used during microscopic examination of samples

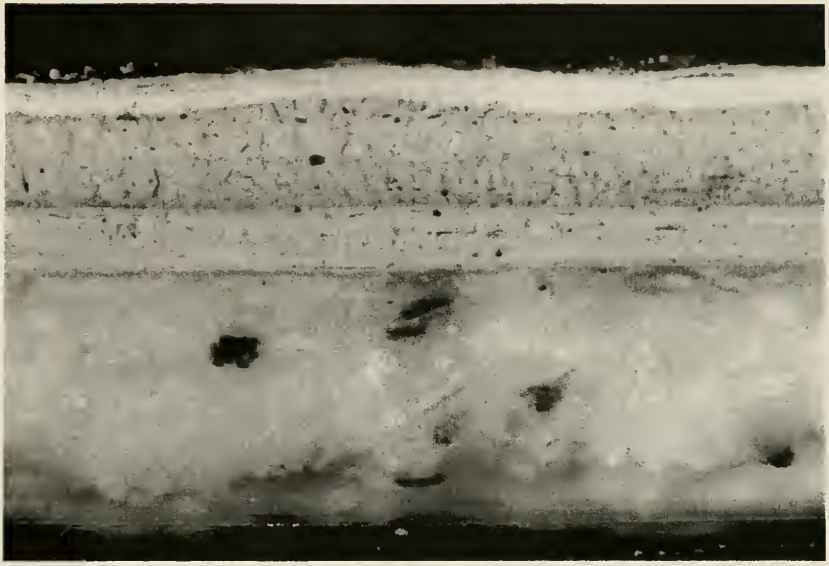


Figure 4.2 Cross-sectional photomicrograph of sample 2.05-3 from the bedroom. During analysis of samples such as this from bedroom 2.05, all layers were recorded and described in terms of color, thickness, and texture on the stratigraphy sheet on the previous page. Magnification is 25X.

4.2 Original Finish Color Investigation

A significant part of the analysis was the identification of the original paint colors. From the samples taken form the Heller House, it was possible to obtain most of the original paint colors, though the pantry and the kitchen had been so greatly altered that investigation and sampling provided no information as to original treatment.

A variety of paint colors were used throughout the house including dark brown in the reception room, light orange in the central hall, green in the drawing room, and red in the dining room. Therefore, the on the two ends of the main axis were painted in contrasting colors. Color theorists in the mid-nineteenth century advocated the use of contrasting primary colors both within rooms and houses.[1] By the end of the century, analogous color schemes were becoming popular as well as tertiary colors. [2]

In the living room, there was decorative banding produced between the wood trim on the walls that were painted with a bronzing powder. The corner of the wall where it meets the ceiling was a band highlighted in a yellow-ochre finish. The dining room alcove also had a bronzing powder between two wood bands.

[1] M.E. Chevreul, *The Laws of Contrast of Colour*, New edition (London: George Routledge and Sons, 1857), 153-155.
[2] Gail Caskey Winkler, Written notes, 29 April 2000.

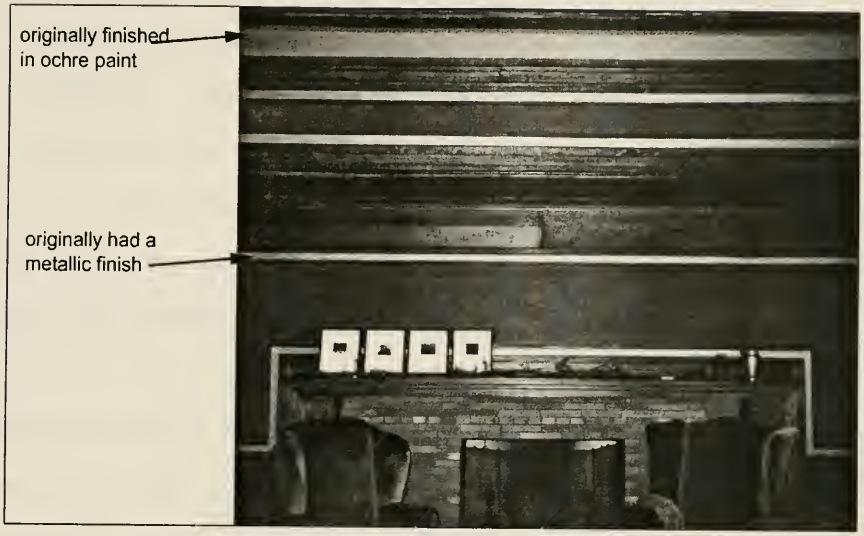


Figure 4.3 **Living room. Original finishes are reproduced in the room today.**

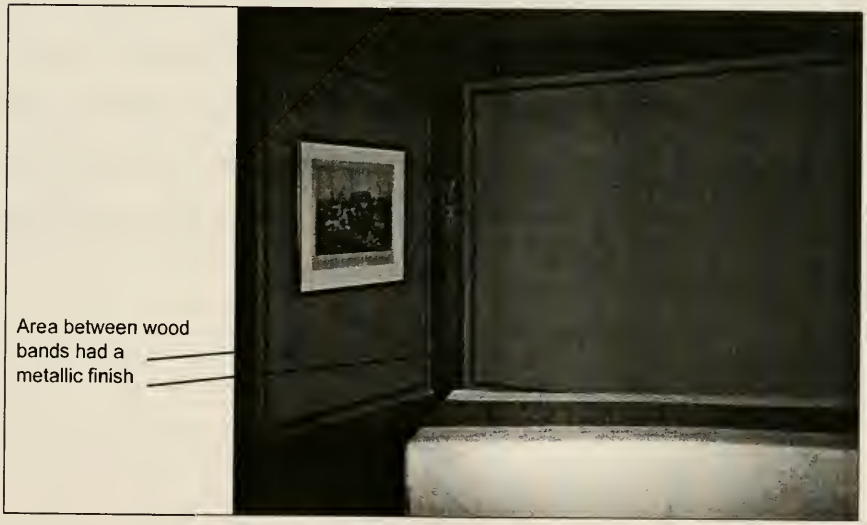


Figure 4.4 **The area between wood bands in the dining room alcove originally finished with bronzing powder.**

While the hall was originally painted in a light orange, the wall panel closest to the living room on the west end of the hall (on the south wall) had originally been painted green to match the living room, while the panel closest to the dining room on the east end of the hall (on the south wall) had originally been painted in red to match the dining room. This unusual treatment may have been chosen to emphasize the continuity along the main axis of the house - helping to connect one space to the next. The hall color would separate but mediate between the living room and dining room colors, red and green. (Figure B.6, B.7.)

While the first floor was painted mostly in red, orange, and brown tones, the second floor, had a greater variety of colors including a blue-green in the master bedroom, an orange-red in another bedroom and a moss green in the sewing room. There was a difference in both plaster and paint color in the transition between the first and second floor halls. Above the rail in the stair hall, the plaster is a smooth finish coat, while in the hall below it is sand-float plaster. The wall color changes from orange in the first-floor hall to red-orange in the second-floor hall. No two rooms on the second floor were painted in the same color.

4.2.1 Color Matching

The original paint layers were matched in cross section under reflected light to the Munsell matte color standards. The table on the following page includes the Munsell color notation, a sample of the finish color, and the sample number and location of the sample used for color matching. (Figure 4.5.)

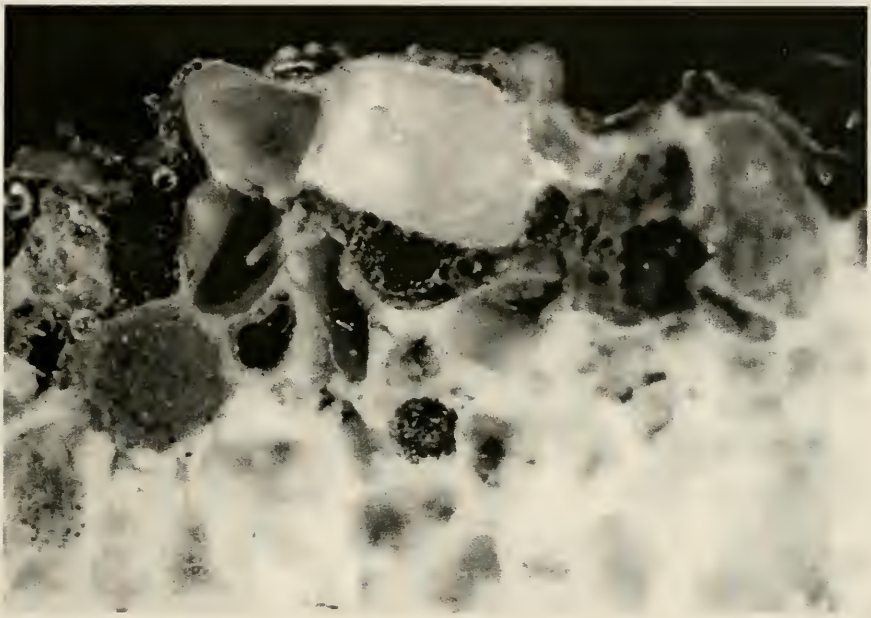
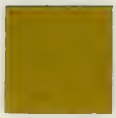


Figure 4.5 The original paint color of the Heller house rooms, including this sample from the living room, was identified by matching the paint layer in cross section under the stereomicroscope to Munsell matte color samples.

Table 4.1 Heller House Paint Colors

Sample representative of	Samples used for color matching	Munsell notation	Color Sample
Vestibule wall field	1.01-5, 1.01-6	2.5 YR 3/2	
Reception Room wall field	1.02-4	5 YR 5/8	
Hall Wall field	1.03-2 1.03-5	7.5 YR 5/8	
Living Room walls ceiling	1.04-1	10 Y 4/2	
Living room area between wall corner and ceiling (band)	1.04-7	10 YR 6/8	
Living room window sash	1.04-2	10 Y 3/2	
Servant Hall between kitchen and elevator	1.08-2	7.5 YR 6/8	
Servants' dining room Wall field	1.09-4	5 YR 3/4	

Sample representative of	Sample used for color matching	Munsell Notation	Color sample
Dining Room wall field	1.12-1	7.5 R 3/8	
Telephone Room	1.13-1	2.5 YR 8/4	
Hall behind stair hall By elevator and porch	1.14-4	5 YR 5/8	
Bathroom first floor	1.15-1	7.5 YR 9/4	
Master Bedroom wall field	2.01-2	2.5 GY 7/2	
Master bedroom exterior of art glass window	2.01-1	7.5 YR 8/4	
Bedroom wall field	2.04-1	10 YR 8/4	
Bedroom wall field	2.05-5	2.5 YR 6/8	

Sample representative of	Samples used for color matching	Munsell notation	Color Sample
Hall (2^{nd} Floor)	2.06-1 2.06-3	2.5 YR 6/8	
Bedroom wall field	2.09-1	7.5 YR 7/8	
Sewing Room wall field	2.12-1 2.12-2	7.5 Y 6/4	
Closet (In hall)	2.13-1	2.5 G 8/2	
Attic Hall and bedrooms	3.03-1	5 GY 5/2	

4.3 Finish Classification

Binding media is typically used for classification of paints or other finishes. Organic binding materials found in architectural finishes include four main groups: lipids, carbohydrates, proteins, and resins or terpenes. The binder contributes to the different characteristics and properties of various finishes. For example, a water-based paint such as a glue distemper appears matte, or low in gloss, whereas an oil based paint is often recognizable because of its gloss and reflectiveness. As part of the identification and interpretation of the types of finishes Wright used in the Heller House, it was essential to identify the binders used in both the original wall and original wood finishes.

Microscopic inspection revealed that the original paint layers from the first floor (living room, dining room, hall, vestibule, reception room) can be described as matte, coarsely pigmented, and very heterogeneous. (Figure 4.6,4.7.) Therefore, in the original paint layers in cross section, groups of pigments are visible, the layers appear coarse, and the color of the paint layer varies across the sample. Samples from the sewing room on the second floor and the attic shared the same characteristics. The visible characteristics of these paint samples suggested that they were distemper paints instead of oil or wax. The original paint layers in such rooms as the first floor bathroom and the second floor bedrooms, were glossy and more homogenous in appearance. (Figure 4.8.)

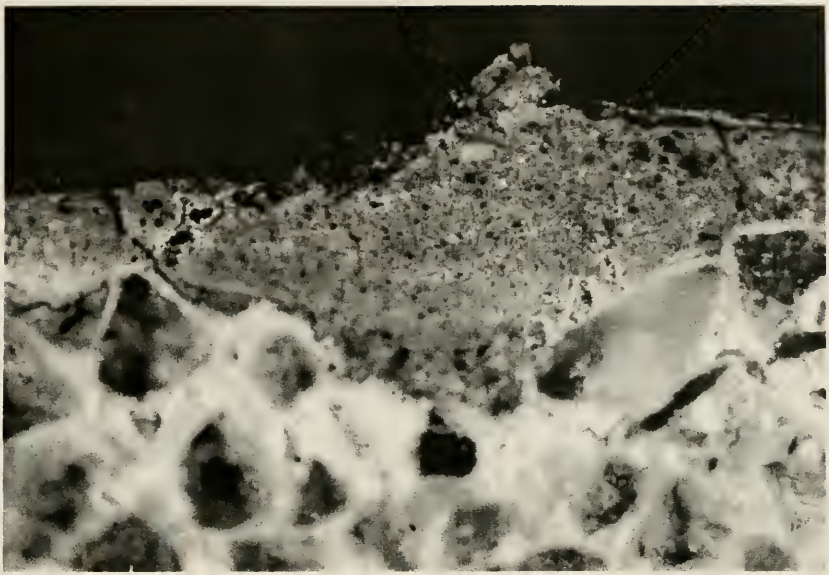


Figure 4.6 Photomicrograph of sample 1.03-2 from the hall. Original orange finish layer is densely pigmented and heterogeneous. Magnification 50X.

Figure 4.7 Photomicrograph of surface of sample 1.04-1 from the living room. The original layer is coarsely textured and the various pigments are visible. 50X.

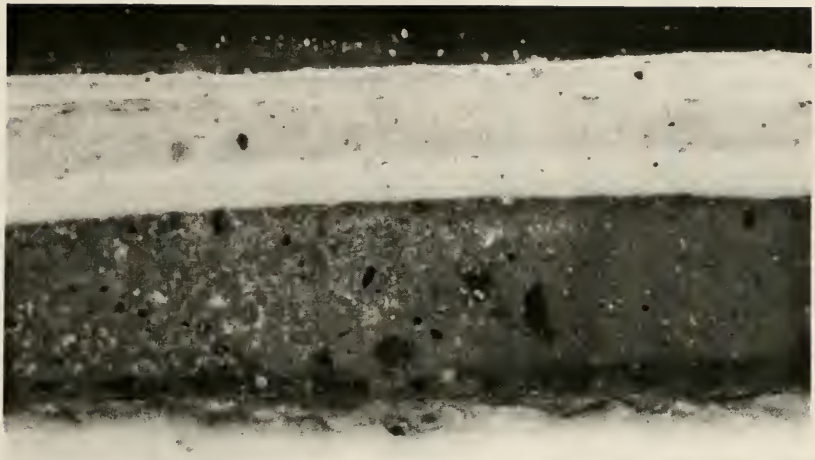


Figure 4.8 Photomicrograph of sample 2.05-4. Original paint in many of the bedrooms appears glossy and well-dispersed. Magnification 50X.

4.3.1 Solubility Testing for Binding Media Analysis

Solubility testing is a relatively simple technique for the basic identification of binding media. It can be done on site or in the laboratory, and is based on whether or not the sample being tested dissolves in certain chosen solvents. A study from Rutherford J. Gettens, entitled "Solubility of Film Substances in Organic Solvents," indicates known solvents used to identify the presence of certain film substances and was used as a model for testing solubilities of Heller House samples in order to characterize their binding media.[3]

Solubility testing was carried out on both paint and wood finish samples. Three original paint layers in the living room, dining room, and hall were tested for water solubility, and all three were soluble. Figure 4.10 shows the result of wetting each of these finishes.

Wood samples showed evidence of varnish, paint and wax layers, which were also tested for their solubility. Table 4.2 indicates the sample tested, what solvents were tested, and draws conclusions about possible media.

[3] Rutherford J. Gettens, "Solubility of Film Substances in Organic Solvents," *Technical Studies* 9, 239 (1941).

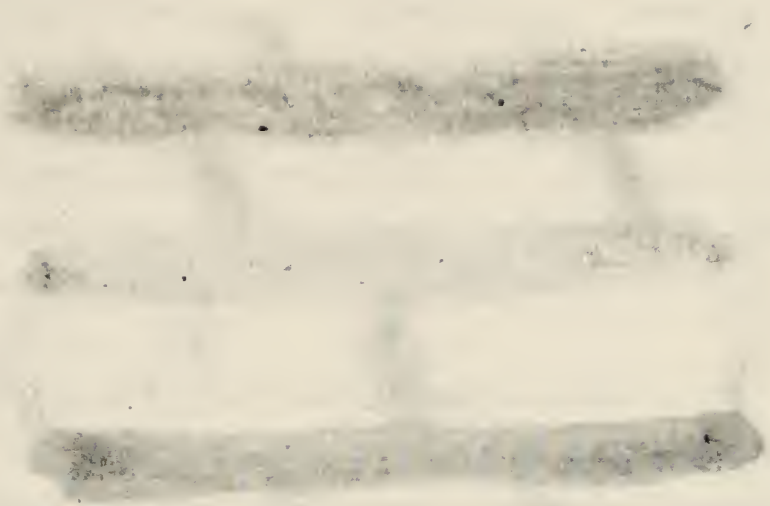


Figure 4.10 **Indication of water solubility of sample 1.03-2, 1.04-1, 1.12-1, the hall, living room, and dining room respectively.**

Table 4.2 Solubility Testing of Selected Heller House Samples

Sample #	Sample description	water	Hot water	alcohol	Acetone	Methylene chloride	Ammonium hydroxide	xylene	Possible media
1.03-1	Orange paint over rough sand plaster	S							Water distemper
1.04-8	Green paint over rough sand plaster	S							Water distemper
1.12-1	Red paint over rough sand plaster	S							Water, distemper
1.01-4	Wood sample with dark finish	NS		SS	S	S	S	SS	resin
1.02-1	Wood sample with shiny surface	NS	NS	SS	S	SS	S	SS	resin
1.09-2	Wood sample	NS	NS	SS	S	NS		S	resin
1.14-1	Wood sample, protected under hardware	NS	NS	NS	NS	NS	NS	NS	wax

S= soluble SS=slightly soluble NS = not soluble

Solubility testing was a simple, low-cost test for subsequent confirmation of the possible binders in the Heller House finishes. The original paint was determined to be water-based in all three samples tested, because it dissolved in water. The wood sample of greatest interest was number 1.14-1 because there is a waxy layer in it, possibly the finish prescribed by Frank Lloyd Wright in his original drawing. (Figure 1.11.)

4.3.2 Fluorescence Microscopy for Binding Media Analysis

Fluorescence microscopy allows certain materials that are visible under ultraviolet light to be observed. Following the preliminary solubility tests, fluorescence microscopy was employed to identify any organic materials in the plaster and wood samples. Therefore, it was used for the identification of organic materials in the samples. Fluorescence microscopy was also used for the clarification and elucidation of layers and materials that might otherwise not be obvious with regular reflected or transmitted light.

The Microscopy Laboratory at the University of Pennsylvania has a Nikon Alphaphot 2 microscope that is equipped for fluorescence microscopy using various filter systems depending on the fluorescence microscopy needed. To investigate auto-fluorescence, (when a material fluoresces on its own when excited by ultraviolet illumination), the BV-1A filter was used. For example, it is known that such things as carbonates and resins auto-fluoresce.

Secondary fluorescence is achieved through the use of fluorescent stains or fluorochromes. These are dyes that make otherwise non-fluorescent materials fluoresce by reacting with certain organic materials and staining them. Appropriate filter blocks for the microscope must be paired with fluorescent stains.[4] A variety of fluorochromes have been developed for the purposes of fluorescence microscopy. The stains and filters below were available in the laboratory at the University of Pennsylvania.

The BV-1A cube is used for observing secondary fluorescence with the stain TRITC, which is a stain that is used for tagging proteins. The XF-22 cube is used with FITC, another stain for proteins. A positive stain with FITC results in a yellow/green secondary fluorescence. The G1-B filter cube is used with the stain Rhodamine B, which stains positive in the presence of lipids. A positive stain with Rhodamine B fluoresces a bright red/orange color and is very difficult to detect because both the light filtered and the stain in this test are red. Additionally, the stain APC, or Antimony Pentachloride, fluoresces blue/white in the presence of natural resins. Finally, DCF fluoresces pink in the presence of saturated lipids and yellow in the presence of unsaturated lipids.

Autofluorescence and the Heller House Samples

For autofluorescence, the sample is viewed with the use of the BV-1A filter cube.

[4] Cassie Myers, Advanced Conservation Science Lecture, February 14, 2000.

It was speculated that many of the dark green window sashes in the Heller house (located in the living room, dining room, and stair hall) were covered with a later varnish later. To find evidence of this layer, sample 1.04-4 was examined for autofluorescence. The latest layer of this sample did autofluoresce providing evidence for possible varnish layer. (Figure 4.10.) This sample was compared to a protected sash sample that did not autofluoresce.

Figure 4.10 Sample 1.04-4 from living room window sash. Ultraviolet light indicates the presence of a resinous layer over the original green paint.

Secondary Fluorescence and the Heller House Samples

Fluorescent staining was employed for the identification of the paint binder. A sample from the living room, hall, and attic were tested for proteins and lipids, to find evidence of distemper versus oil paints. DCF was the stain used for lipids, and both FITC and TRITC were used for the identification of proteins. The samples did not stain positively for either binder. Therefore fluorescence microscopy was not successful for the identification of the paint binder.

Sample tested	Original sample location	Stain used	Result
1,03-2	Hall	DCF FITC	Negative Negative
1.04-1	Living room	DCF FITC	Negative Negative
3.03-1	Attic	DCF FITC TRITC	Negative Negative Negative

Table 4.3 Testing for Secondary Fluorescence

4.3.3 Infrared Spectroscopy for Binding Media Analysis

Fourier Transform Infrared Spectroscopy, or FTIR, is the study of infrared radiation on matter and is important because it can provide information on functional groups present in a molecule allowing for the identification of both organic and many inorganic materials. In IR Spectroscopy, the change in the vibrational energy level of a molecule is studied. When a sample is exposed to IR radiation, the molecules of the sample selectively absorb portions of the IR radiation causing vibrations in the material. The unabsorbed part of the radiation is passed through the sample and is measured and recorded as an infrared spectrum. Every unique compound produces a unique IR spectrum. The

intensity, on the y-axis, is plotted against, on the x-axis. Absorption bands that occur on the spectrum are directly associated with different parts of the molecule. The IR spectra are then interpreted to uncover the unknown material. Experienced analysts can recognize characteristic band positions, shapes, and intensities and can compare the results with reference standards available in the field.[5]

In architectural finish analysis, FTIR can be very helpful in the classification of binding media. Additionally, it can identify the presence of pigments and other organic and inorganic materials. Representative paint samples of the Heller House were analyzed at the Philadelphia Museum of Art under the direction Beth Price, Senior Scientist. The table below indicates the samples that were tested and the binders that were identified through this technique.

Sample #	Sample Description	Possible Media Identified	Computer Library Match
1.04-1	Original green paint from living room painted plaster sample	protein	Hide glue
1.03-2	original orange paint from hall painted plaster sample	polysaccharide	corn starch
1.12-1	Original red paint from dining room painted plaster sample	polysaccharide	gum
1.14-1	Finish from protected wood sample, bathroom door	wax	beeswax
1.08-3	Finish from protected wood sample from double closet door, servants' hall	resin	Varnish and linseed oil

Table 4.4 Samples investigated with FTIR for binder identification

[5] Beth Price, Lecture on Infrared Spectroscopy, Philadelphia Museum of Art, 20 March 2000.

A paint sample from the living room, sample 1.04-1, was tested and the characteristic peaks of proteins confirmed the presence of protein as a binder in the sample. (Figure 4.11.) The binder was found to be either glue or milk, and the sample is therefore either a distemper or a casein paint. A glue distemper paint is more likely, because this was the closest match to the computer library of standards. However, the technology available cannot distinguish between proteins, since they have the same or very similar characteristic peaks in their IR spectra. Two other types of analysis, namely gas chromatography-mass spectrometry and reverse phase–high-pressure chromatography would be necessary to pinpoint the type of binder. These techniques were not available given the constraints of the study.

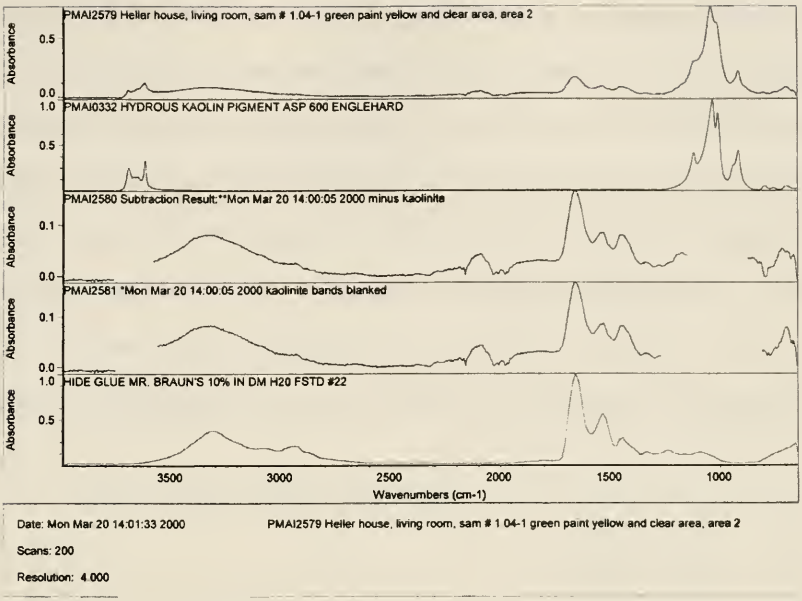


Figure 4.11 FTIR spectra of Sample 1.04-1 from the living room. The spectra indicate the characteristic peaks of protein, possibly a glue binder, in the original living room finish.

An orange paint sample from the hall, sample 1.03-2, underwent FTIR analysis. The spectrum indicated the clear presence of starch in the sample. (Figure 4.12.) Since starch was not known as a common binder in paint, four different portions of sample 1.03-2 were tested in order to clarify the results. Each time the characteristic peaks of polysaccharides appeared in the FTIR spectra and the computer library of standards that is linked to the FTIR system indicated that cornstarch had very similar FTIR spectra in relation to sample 1.03-2. Though starch is much less commonly known as a binder for paints, it has been mentioned historically as a binder for distemper and other water-based paints.[6]

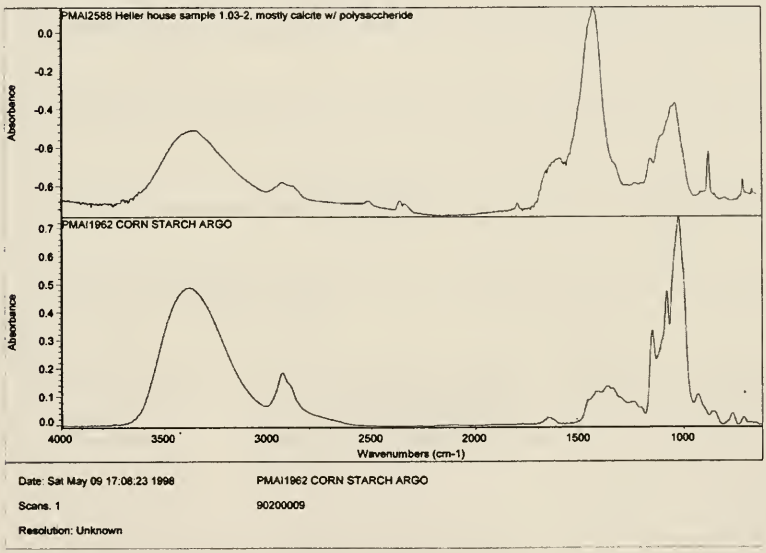


Figure 4.12 FTIR spectra of sample 1.03-2 from the hall indicate the presence of a polysaccharide, namely starch, as a binder.

[6] See section 2.3.1.

A sample from the dining room, 1.12-1, was analyzed with FTIR for binder identification. Here, the characteristic peaks of a gum-like polysaccharide were present. Close matches in the museum library were gum arabic and gum tragacanth. The spectrum of sample 1.12 is shown below. (Figure 4.13.) Gum arabic has been mentioned historically as a binder for distemper and other water-based paints. (See section 2.3.1.) Therefore, there were three different paint binders used in the three major first floor rooms. Each created a different type of distemper or water-based paint.

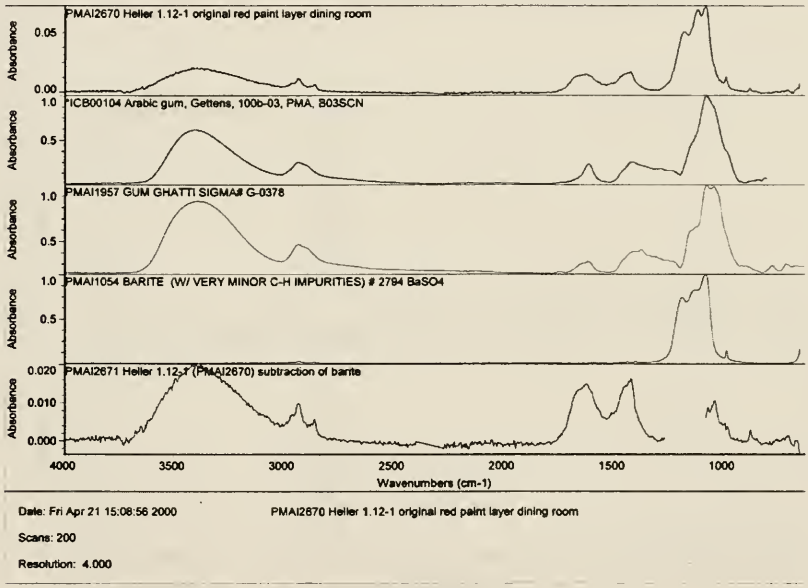


Figure 4.13 FTIR analysis of sample 1.12-1 illustrates the presence of a gum-like polysaccharide in the original red paint in the dining room.

Sample 1.14-1 was a wood sample taken from behind door hardware on the bathroom door on the first floor of the Heller House. After microscopic examination and solubility testing, it was postulated that there was a coating of wax on this sample. There was no evidence of any subsequent layers of either resins or paints over this sample. As mentioned previously, sample 1.14-1 is of interest because it contains evidence of wax, which was Wright's original intent for the wood in the Heller House. With FTIR analysis, the characteristic peaks of beeswax were identified in this sample. (Figure 4.14 below.) Therefore, evidence of Wright's intended wood finish was found in this protected sample.

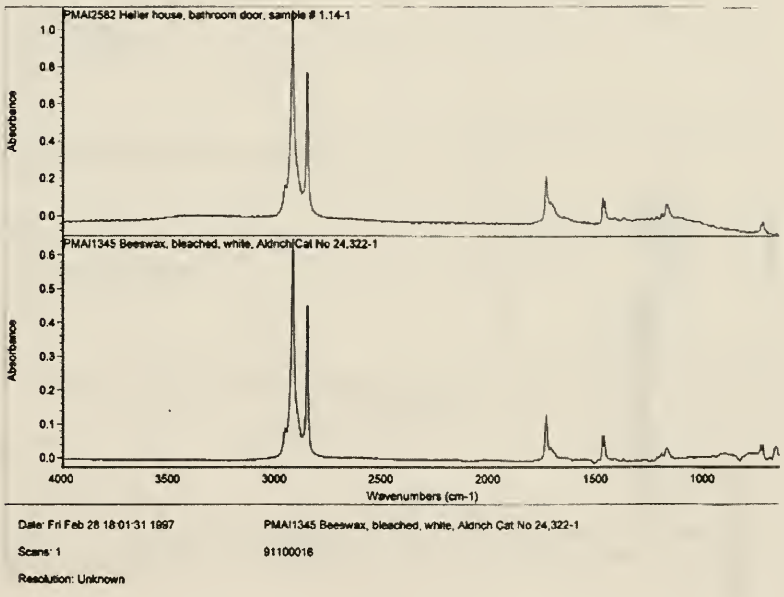


Figure 4.14 FTIR Spectrum of sample 1.14-1 containing characteristic peaks of beeswax on the wood sample from bathroom door.

Sample 1.08-3 was another wood sample taken from the door of the closet in the servant's hallway. This sample, like all other samples other than 1.14-1, discussed above, had evidence of a resinous layer. This sample was analyzed for comparison against the wax sample above. The FTIR spectra obtained from this sample had characteristic peaks of resins. (Figure 4.15.) It is obvious that most of the wood in the Heller house today has a resinous finish. The evidence of resin on this sample suggests that subsequent finish treatments have been placed over the original wax finish of unknown dates.

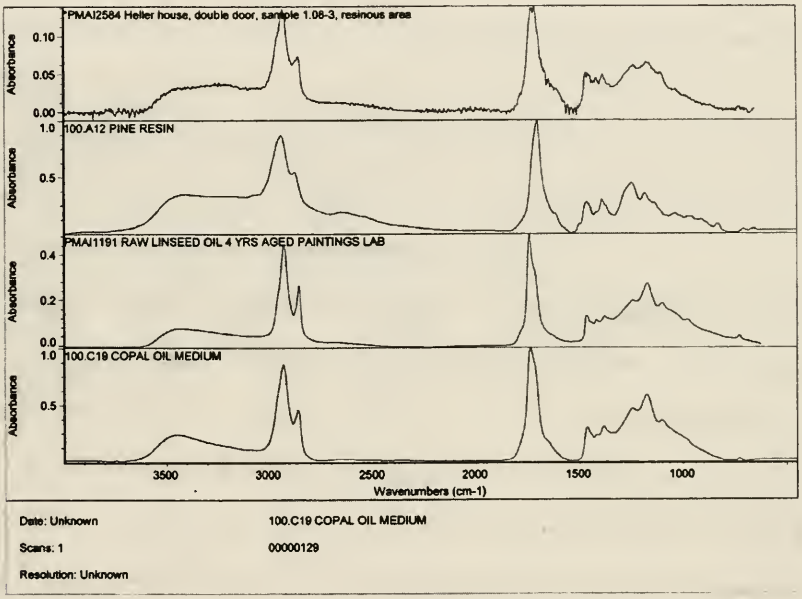


Figure 4.15 FTIR Spectra of sample 1.08-3 indicate the presence of a resin or varnish mixed with a small amount of oil on the wood from the hallway closet.

4.4 Pigment Identification

A variety of techniques have been developed for pigment identification of architectural finishes. These include micro-chemical spot testing, visible and polarized light microscopy, scanning electron microscopy with X-ray energy dispersive analysis and electron dot mapping, FTIR, and X-ray diffraction. For the purposes of this project, visible and polarized light microscopy, scanning electron microscopy (SEM), with EDS and electron dot mapping, and FTIR were utilized. Micro-chemical spot testing often yields false results with pigment analysis. It was not possible to employ X-ray diffraction given the small amount of pigments available since the Laboratory for Research and Study of Materials at the University of Pennsylvania is not readily equipped for testing of such small amounts through X-Ray diffraction.

4.4.1 Visible and Polarizing light microscopy

The cross-sectional analysis of the various paint samples suggested a variety of pigments were used to create the original paints found in the Heller House. In four of the samples, 1.03-2, 1.04-1, 1.12-1, and 1.12-5, pigments were mechanically removed from the paint layers with a tungsten needle and were dispersed on a microscope slide. This involved removing enough pure pigment from the samples, placing them on a slide, dispersing the pigments with a cover slip, and mounting them permanently in this state with the use of Meltmount® mounting medium. After the pigments from each sample were dispersed separately, they were examined under the microscope and compared to the

dispersed pigments available in the reference slide particle library in the Microscopy Laboratory at the University of Pennsylvania. The dispersed samples were also visually compared to the McCrone particle atlas, which as contains microscopic images of various particles, including pigments.[7] They were also compared to a particle atlas that illustrates various particles. The pigments were matched up with a pigment in the library, and were examined under polarized light to identify whether or not they had the same optical properties. (Figure 4.16-14.19, C.1-C.5.)

Through microscopic techniques, the following pigments were identified in the representative samples:

SAMPLE USED FOR DISPERSION	SAMPLE LOCATION	COLOR OF PIGMENT	PIGMENT IDENTIFIED
1.03-2	Hall	Red Yellow Brown	Yellow ochre Red ochre
1.04-1	Living room	Green Blue Yellow-brown	Chrome green Prussian blue Yellow ochre
1.12-1	Dining room	Red Black	Burnt sienna
1.12-5	Dining room	Metallic	Copper (cuprous bronzing powder)

Table 4.5 Pigment identification through sample dispersion

Reflective particles in the drawing room ceiling sample (1.04-1) were analyzed for the presence of quartz. The reference quartz was used to compare to the reflective particles extracted from the surface of this sample. (Figure 4.16, 4.17.)

[7] Walter McCrone, *The Particle Atlas*, (Ann Arbor, Michigan: Ann Arbor Science Publishers, Inc., 1973)

Figure 4.16 reflective material extracted from sample 1.04-1, from the living room ceiling, optically similar to quartz. Magnification 200X.

Figure 4.17 Reference sample of quartz. Note resemblance to sample 1.04-1 above. Magnification 100X.

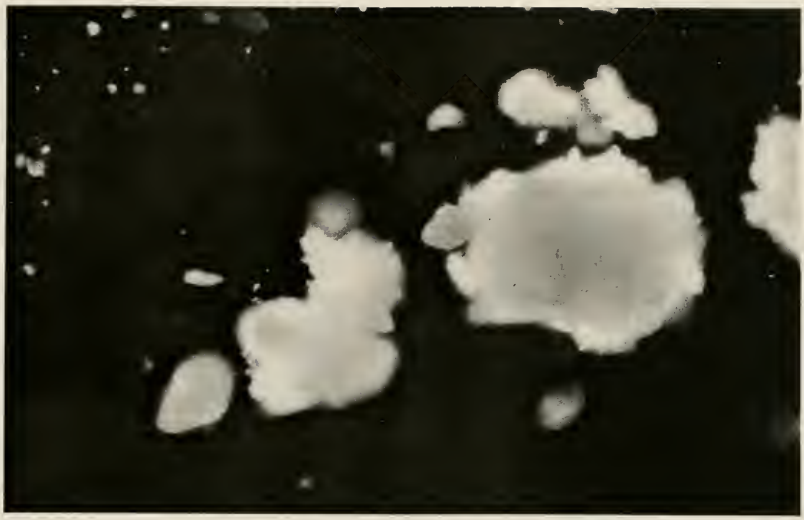


Figure 4.18 Yellow pigments extracted from sample 1.03-2 from the hall, identified as yellow ochre. Magnification 200X.

Figure 4.19 McCrone reference sample of yellow ochre pigments. Mag. 200X.

4.4.2 Infrared Spectroscopy for Pigment Identification

Finish samples were analyzed for pigment content through infrared spectroscopy with the same technique described earlier for the characterization of binding media (section 4.3.3). During analysis for the binding media of samples 1.04-1, 1.03-2, and 1.12-1, pigments were also identified. The green pigment present in the living room sample (1.04-1) had IR spectra characteristic of chrome green, which is a mixture of chrome yellow ($PbCr0_4$) and Prussian blue ($FeNH_4Fe(CN)_6$). (Figure 4. 20.) This confirmed the presence of chrome green in this sample that had been identified earlier through microscopy (section 4.4.1). Sample 1.04-1 also contained barite, $BaSO_4$, a white pigment often used as a filler. Additionally, the yellow pigment present in the orange paint from the hall was identified as goethite (FeOOH) or a form of yellow ochre. (Figure 4.22.) Sample 1.12-1 also contained the pigment barite. (Figure 4.23.)

Additionally, the reflective particles from living room sample 1.04-1 were analyzed with FTIR. The FTIR spectrum for this sample contained the characteristic peaks of quartz, confirming the use of quartz in the original living room paint layer. (Figure 4.21.)

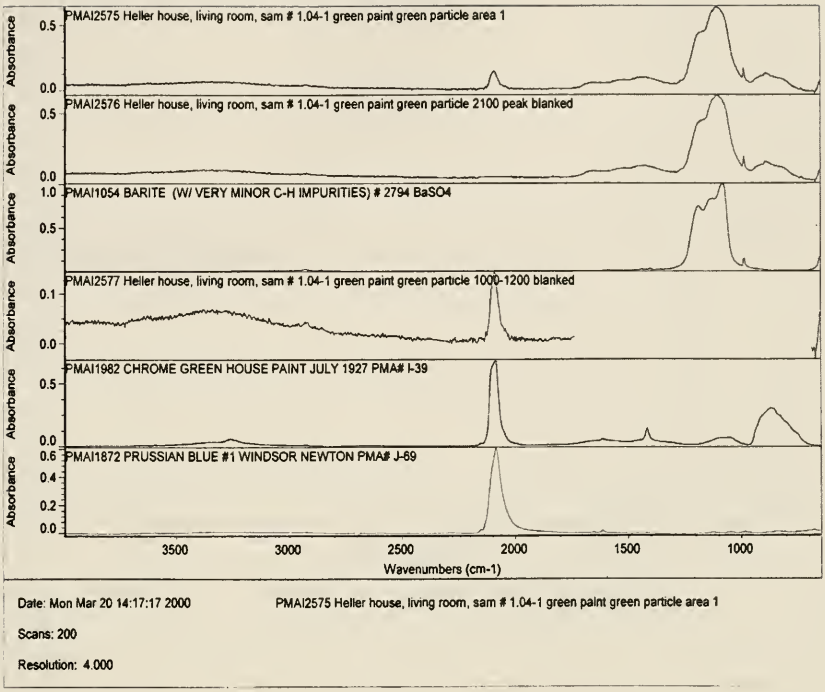


Figure 4.20 FTIR Spectra of Sample 1.04-1 indicating the presence of barite and chrome green pigment in the original paint layer in the living room.

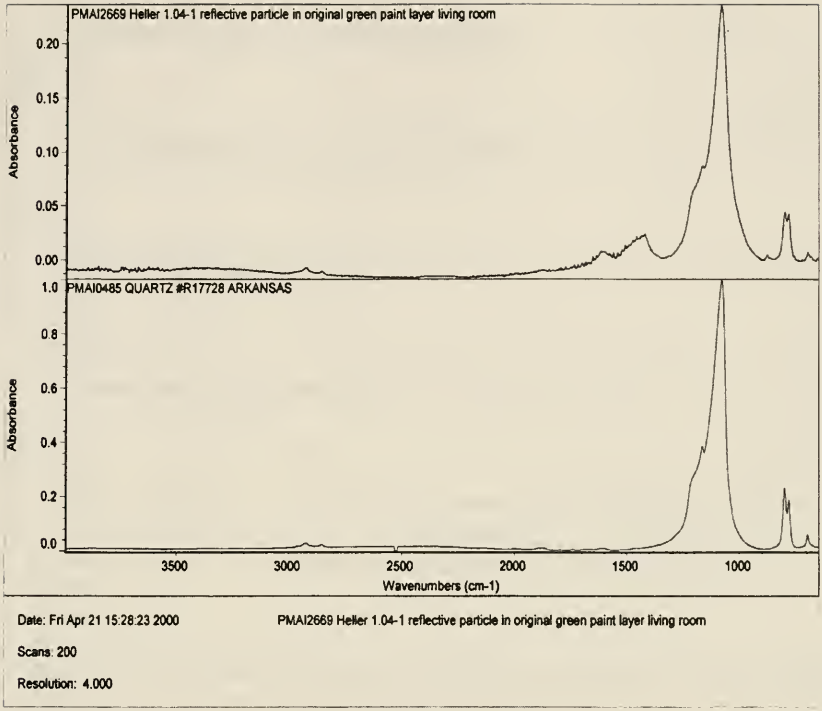


Figure 4.21 FTIR spectum of reflective particles in the surface of sample 1.04-1 from the living room. The particles are identified as quartz.

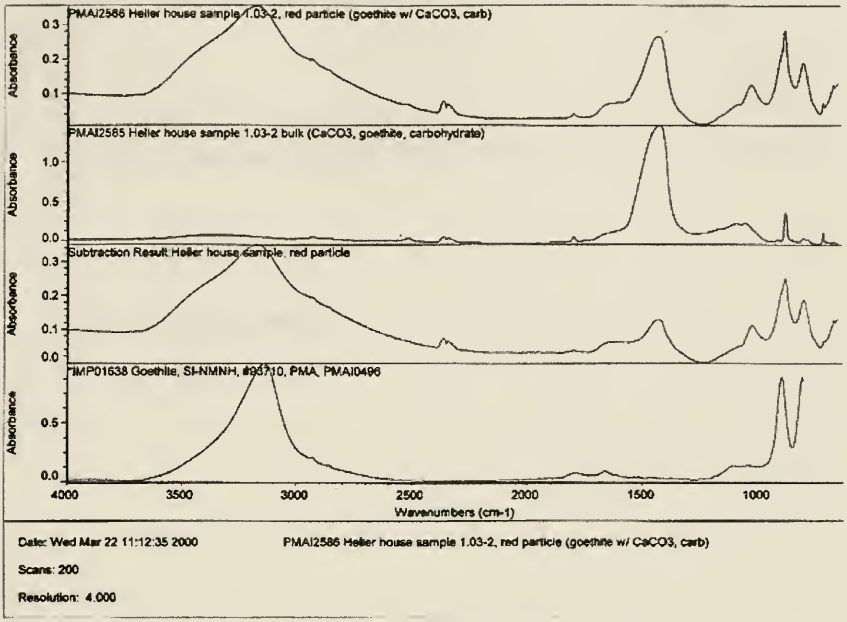


Figure 4.22 FTIR Spectra of sample 1.03-2 indicate the presence of the red pigment goethite (FeOOH) in the original paint layer in the hall.

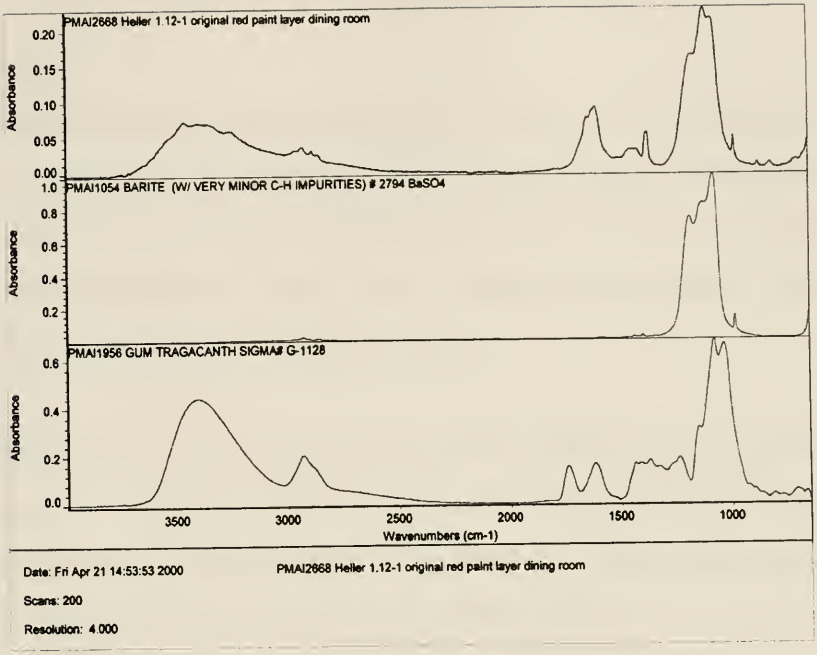


Figure 4.23 FTIR spectrum of sample 1.12-1 from the dining room indicates the presence of barite ($BaSO_4$) in the original red paint layer.

4.4.3 Scanning Electron Microscopy for Pigment Identification

SEM/EDS

Another resource available for the identification of elements in a finish sample is the scanning electron microscope (SEM) coupled with energy dispersive X-ray analysis (EDS) for elemental identification. This technique can be useful in pigment identification of finish samples, because certain pigments contain indicative elements that can help identify them.

SEM/EDS was used on three samples from the Heller House. The first was sample 1.04-7 which had a thin metallic layer. This gold-colored finish was found between wooden trim pieces in the living room and was a decorative finish emphasizing the different planes and spaces within the room.

SEM/EDS identified characteristic peaks of copper and zinc and a trace of nickel in this thin metallic layer. (Figure 4.24.) Therefore, this finish was an imitation metallic finish, identified as a metallic flake or "bronzing powder" popular during the nineteenth and early-twentieth century.

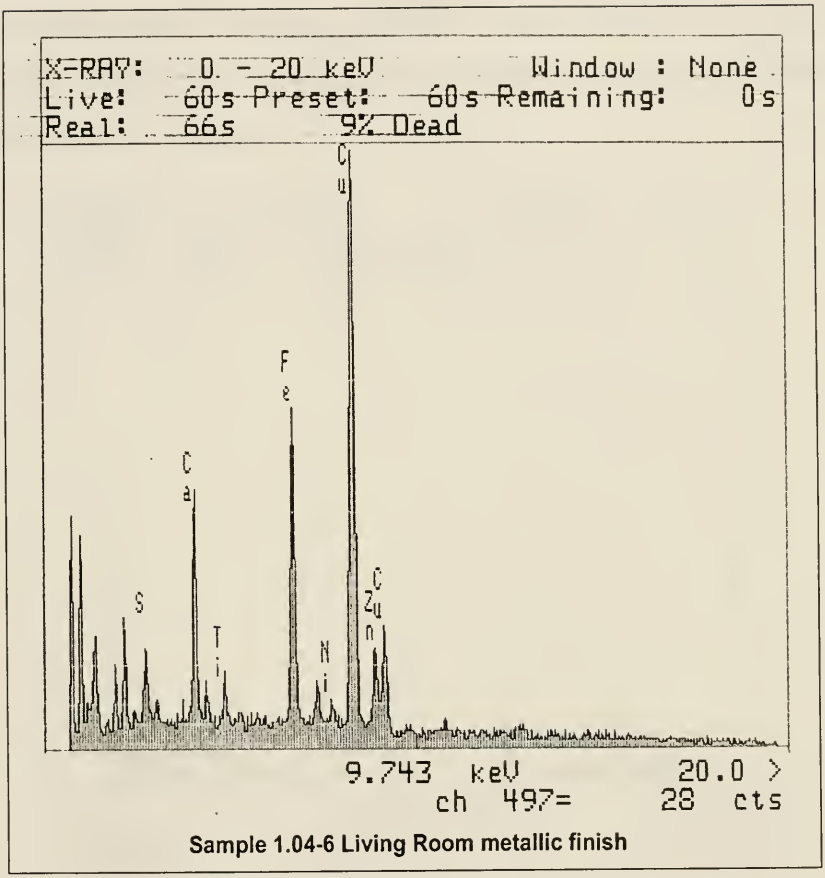


Figure 4.24 EDS spectrum of metallic layer in living room indicating the presence of Copper, Zinc, and Nickel in the bronzing powder.

The second sample analyzed with this technique was sample 1.12-5, taken from the dining room in an area between the parallel strips of wood trim located in the alcove. Here analysis identified the presence of copper exclusively in this layer. (Figure 4.25.) Therefore, It is possible that a different colored bronzing powder was used in the two rooms.

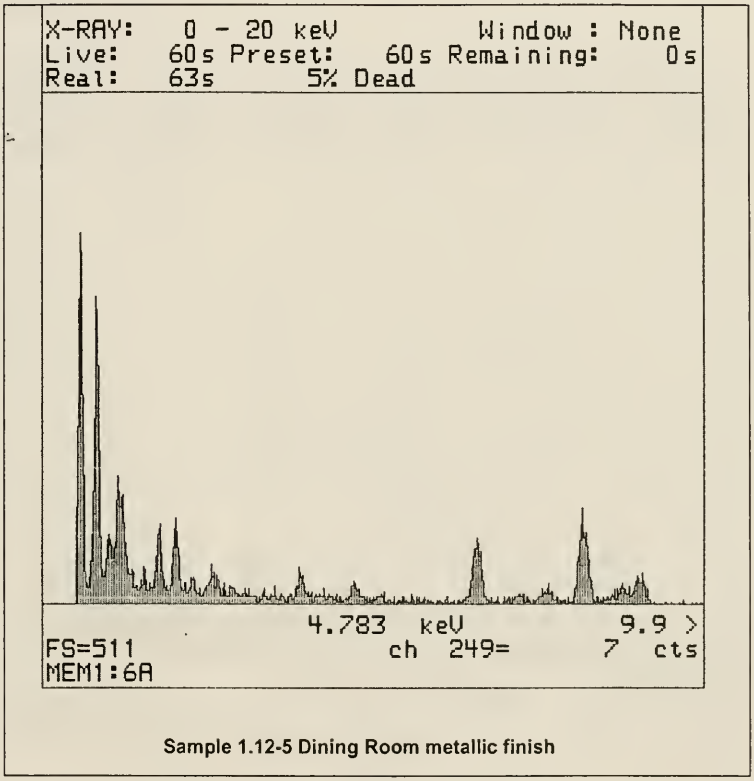


Figure 4.25 EDS spectrum of sample 1.12-5 indicating the characteristic peaks of copper in the bronzing powder.

The third sample analyzed with SEM/EDS was 1.12-1, containing original red paint from the dining room wall. SEM/EDS analysis indicated the presence of iron in the red colorant used for the dining room finish, suggestive of a red ochre. Incidentally, lead was ruled out as a possible pigment used in this room, because the characteristic peaks of lead were not present in the spectra collected. (Figure 4.26 below.)

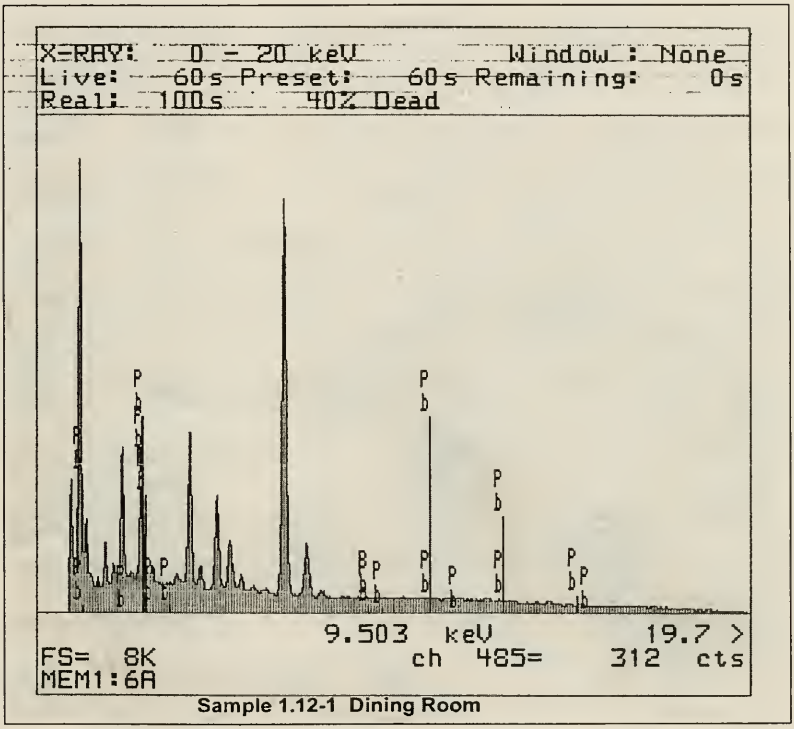


Figure 4.26 EDS Spectrum of original paint layer of sample 1.12-1 indicates the presence of an iron-based pigment in the dining room.

Electron Dot Mapping

Electron dot mapping is another microscopic technique that was employed effectively with the Heller House samples. Using the scanning electron microscope, elements can be mapped across a given sample and the exact locations and concentrations of elements were visually interpreted. This technique is especially valuable when analyzing samples containing various layers and materials. Chosen elements can be keyed into the computer and the computer quantitatively collects the presence of the elements.

A number of Heller House samples were analyzed using the electron dot mapping. The following chart indicates the elements and possible pigments identified through this technique.

Sample #	Original layer	Elements detected in original layer	Possible pigment
1.01-5	Brown	Iron (Fe)	Yellow Ochre Umber
1.03-5	Green over orange	Iron (Fe) Barium (Ba)	Red Ochre Yellow Ochre Barite
1.04-1	Green with reflective material	Iron (Fe) Barium (Ba)	Yellow Ochre Barite Prussian blue
1.04-6	Metallic layer	Copper (Cu) Zinc (Zn)	Bronzing powder
1.04-7	Ochre over green	Iron (Fe) Barium (Fe)	Yellow Ochre Barite
1.12-1	Red	Iron (Fe)	Rec Ochre Burnt Sienna
1.12-5	Metallic layer	Copper (Cu)	Bronzing powder
2.01-2	Light green-blue	Calcium (Ca)	Whiting
2.12-1	green	Iron (Fe) Calcium (Ca) Barium (Ba)	Ochre Whiting Barite

Table 4.6 Pigment Identification through Electron Dot Mapping

Results from electron dot mapping of sample 1.04-6 illustrate the merits of this technique. This sample contains the metallic layer believed to be a bronzing powder that was part of the original living room decoration. The microscope is focused on a specific area of the cross section and the area is scanned for possible elements present. The sample is then mapped according to location and concentration of a given element in the chosen area. Copper, zinc, magnesium, lead, titanium, calcium, potassium, and silicon were mapped across the chosen area of sample 1.04-6 to identify the components in the metallic finish. The mapping indicated a dense concentration of copper and a small amount of zinc in the layer. (Further results from electron dot mapping located in Appendix D.)

Figure 4.27 Scanning Electron Image of metallic layer in sample 1.04-6 from the living room metallic finish. The center line is the location of the metallic finish in the sample.

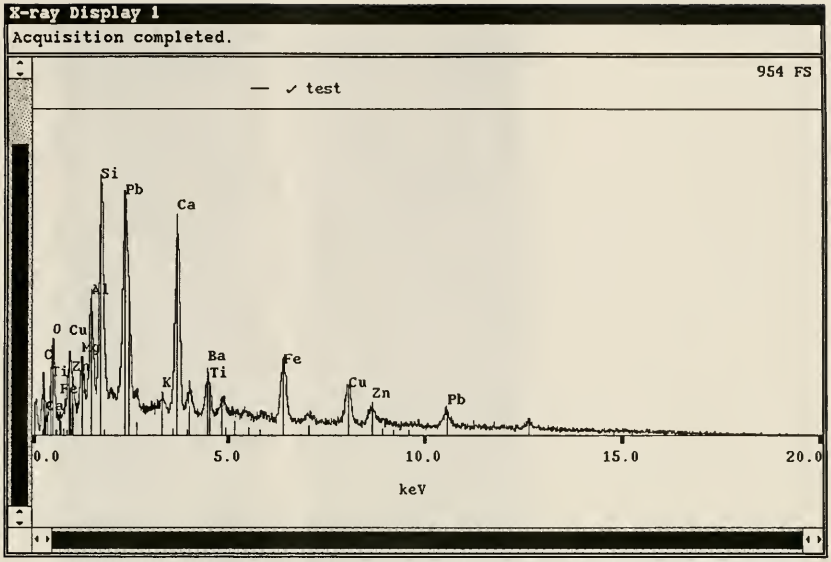


Figure 4.28 EDS spectrum collected from metallic layer of sample 1.04-6.

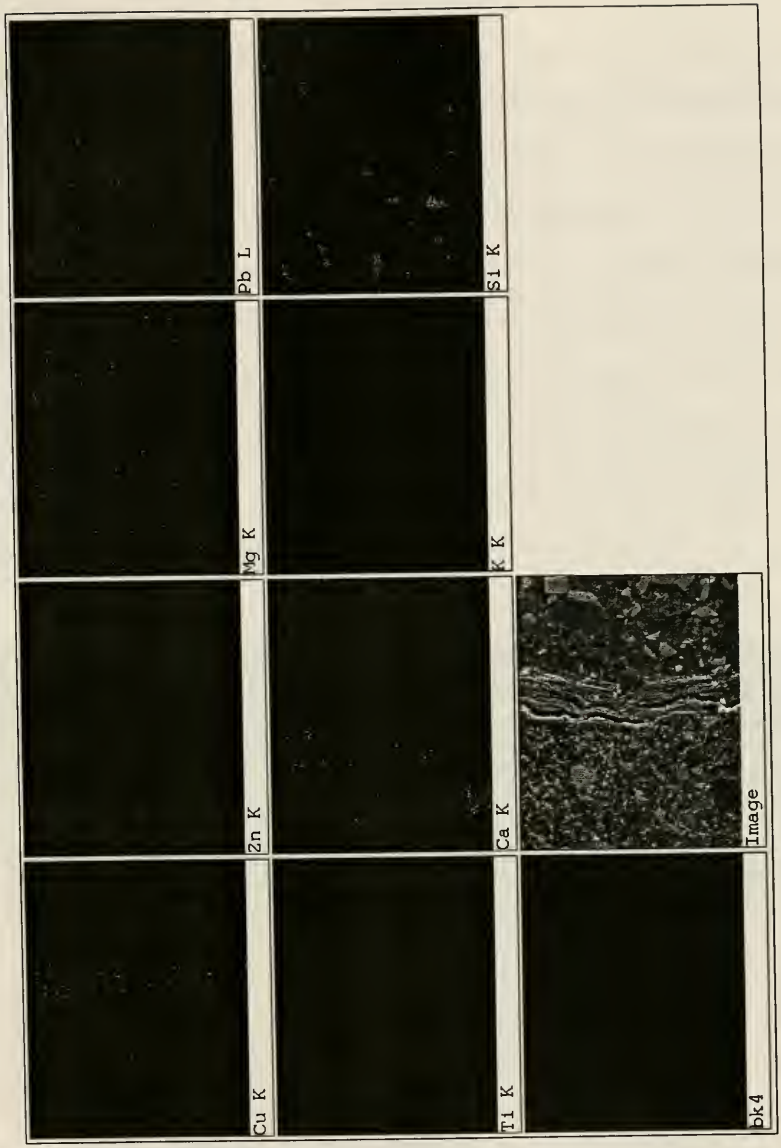


Figure 4.29 **Electron dot map of sample 1.04-6. Copper is evident in the metallic layer.**

4.5 Plaster Classification

In the Heller house two original plaster types were found. Upon initial inspection of the samples, it was determined that the three primary rooms on the first floor--the living room, dining room, and hall--and the attic hallway and bedrooms were finished with a rough sand-float plaster over which paint was directly applied. All other rooms in the Heller House were finished with a rough scratch coat followed by a white, smooth finish coat. The finish coat was beige in color and had occasional inclusions of sand. In addition to the original plaster types, newer plaster was found where there have been additions or alterations made to the house. (Figures 4.30-4.32.)

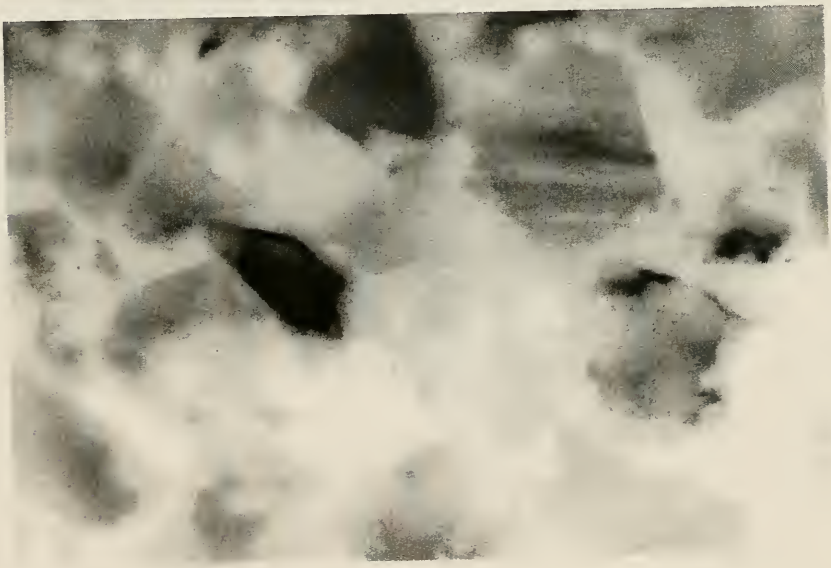


Figure 4.30 **Photomicrograph of sand-float plaster. Magnification 200X.**

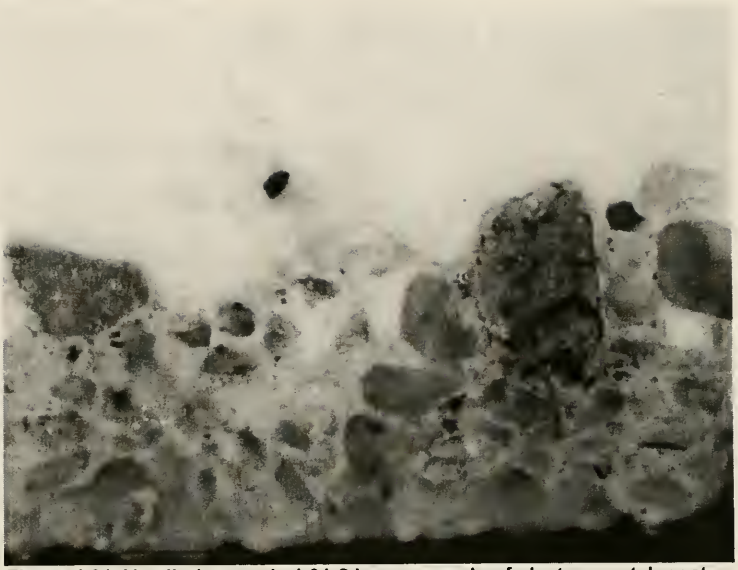


Figure 4.31 Vestibule sample 1.01-2 is an example of plaster scratch coat and finish coat in many of the rooms. Magnification 50X.

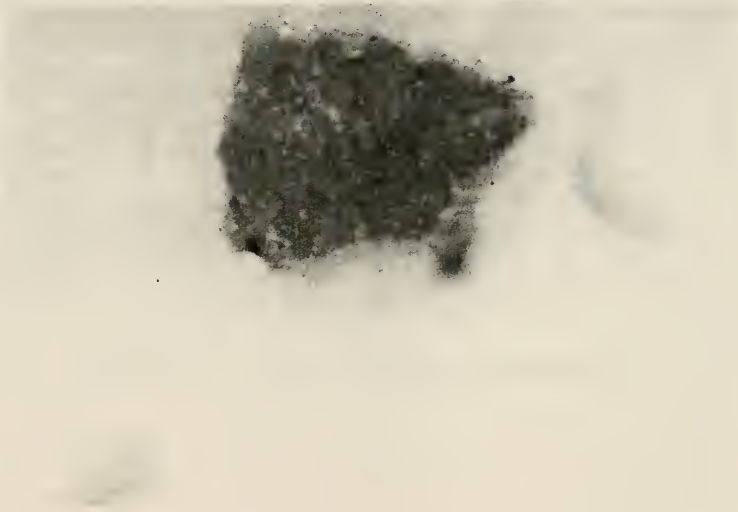


Figure 4.32 Example of the finish plaster coat. Color ranges from beige to white. Occasional inclusions of sand occur in this coat.

4.5.1 Visual description

Each plaster sample was inspected for its visual characteristics. Each of the samples fell into one of the following three categories:

1. Original rough sand float plaster
2. Original rough scratch coat over which a smooth finish coat was applied
3. Modern plaster over old finish coat

Room Name	Room Number	Plaster type
vestibule	1.01	2
reception	1.02	2
hall	1.03	1
Living room	1.04	1
Servants hall	1.08	2
kitchen	1.09	3
Dining room	1.12	1
Telephone room	1.13	2
hall	1.14	2
bathroom	1.15	2
Master bedroom	2.01	2
bedroom	2.04	2
bedroom	2.05	2
Hall	2.06	2
bathroom	2.08	2
bedroom	2.09	2
Closet	2.10	2
Closet	2.11	3
Sewing room	2.12	3
Maid's closet	2.13	2
Hall, Attic	3.03	1

Table 4.7 Plaster Types found in each room

4.5.2 Particle Size Analysis for Plaster Characterization

To assist in the characterization of the scratch coat plaster in the Heller house, a particle size distribution test was run. It was not possible to run this test for the sand float plaster, because a very small amount of sand-float plaster was removed from the Heller House (less than 5 grams). For any accuracy in this test, 20 grams of material is required.[7] Also, this test was not was not run for the finish coat because its particles are too small for this test to be valuable.

Particle size distribution involves selecting a representative plaster sample, drying it to a constant weight, crushing it with a mortar and pestle, and sieving the material through a stack of sieves ranging from large to small. The sieve stack used for both tests contained 6 sieves ranging largest to smallest from 2.36 mm to 75 microns. Particle size is usually given in terms of equivalent particle diameter, but can also be given interns of sieve size. ASTM standards were used in this test and therefore the particles were grouped into gravel, sand, silt, and clay according to the dimensions illustrated below. Most of the sample ranged from fine to coarse sand, while a very small percentage, 9%, fell into the silt or fines category (below 75 microns.)

[7] Jeanne Marie Teutonico, Particle Size analysis in *A Laboratory Manual for Achitectural Conservators* (Rome: ICCROM, 1988), 73.

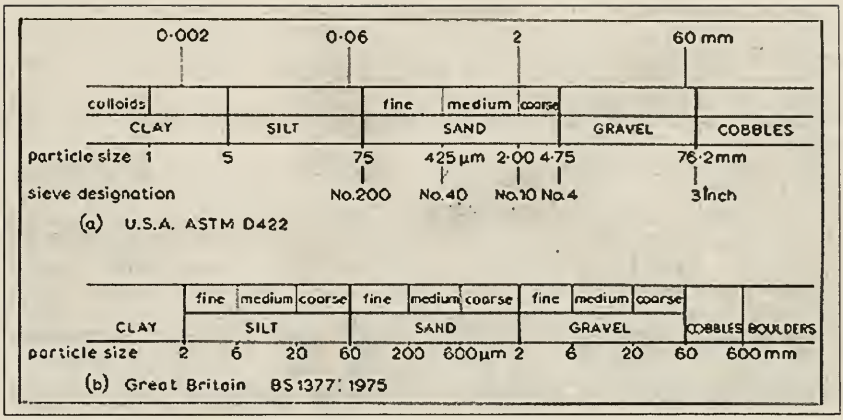


Figure 4.33 Particle size distribution from Teutonico, 73.

The chart below indicates the results from the test of the scratch coat plaster. The initial mass of the plaster was 7.65 grams. The distribution of particle size is indicated.

Sieve #	Diameter	Weight retained (g)	Percent retained
8	2.36 mm	.2	2.6
16	1.18 mm	.25	3.3
30	600 um	.45	5.9
50	300um	.96	12.7
100	150 um	5.28	70
200	75 um	.37	4.9
PAN		.07	.9

Table 4.8 Sieve Analysis

4.5.3 X-Ray Diffraction for Plaster Characterization

X-Ray Diffraction was employed to determine specific components of the plaster binder. X-Ray Diffraction involves aiming a beam of X-Rays onto a sample containing crystals. The diffraction pattern of the crystalline sample can be used to identify a specific material because every crystalline substance has a unique XRD pattern, or "fingerprint".[8]

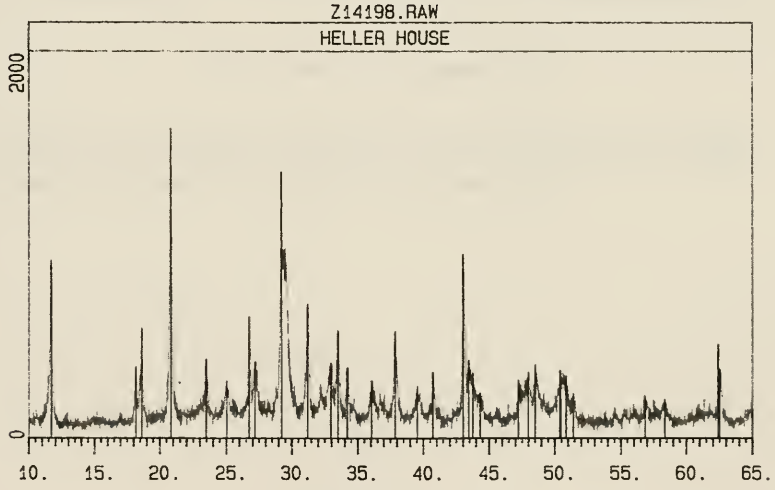
Two samples from the Heller House plasters were analyzed with X-Ray diffraction. The first sample tested was taken from the finish coat from the upstairs hall (room 2.06). The finish coat was scraped off of the sample and ground with a mortar and pestle. The second sample was taken from the fines (particles smaller than 75 um) from the binder of the sand-float plaster of the living room (room 1.04), in order to identify the elements of the plaster binder. The fines were separated with sieves whereas the particles small enough to fit in the pan, assumed to be the major component of the sand-float plaster binder, were ground up and prepared for the XRD analysis.

The major component of the finish plaster coat that was analyzed with XRD (sample 2.06-1) was identified as calcium sulfate hydrate, otherwise known as gypsum. This result is not surprising because plasters are often composed of

[8] Elsa Bourguignon, Sarah Gray, Zana Wolf, *Analysis of Clay Minerals by X-Ray Diffraction*, Report for Advanced Conservation Science, University of Pennsylvania, 1999.

gypsum or plaster of Paris historically. The XRD spectra collected contain the characteristic peaks of gypsum. (Figure 4.34.)

The spectra collected for the sand-float plaster binder (sample 1.04-5) are less clear. Characteristic peaks of quartz, calcium hydroxide, dolomite, magnesium oxide, calcium carbonate, magnesium arsenate, and magnesium hydroxide were found. The substance tested, which was the fines resulting from sieving of the plaster, is probably a mixture of both plaster binder and small aggregate particles of the plaster. This is probably a lime-based plaster, because of the presence of calcium hydroxide and calcium carbonate. (Figure 4.35.)



Sample 2.06-1 finish coat

Figure 4.34 XRD spectra from finish coat plaster of sample 2.06-1 from the upstairs hall indicating the presence of gypsum in the finish coat.

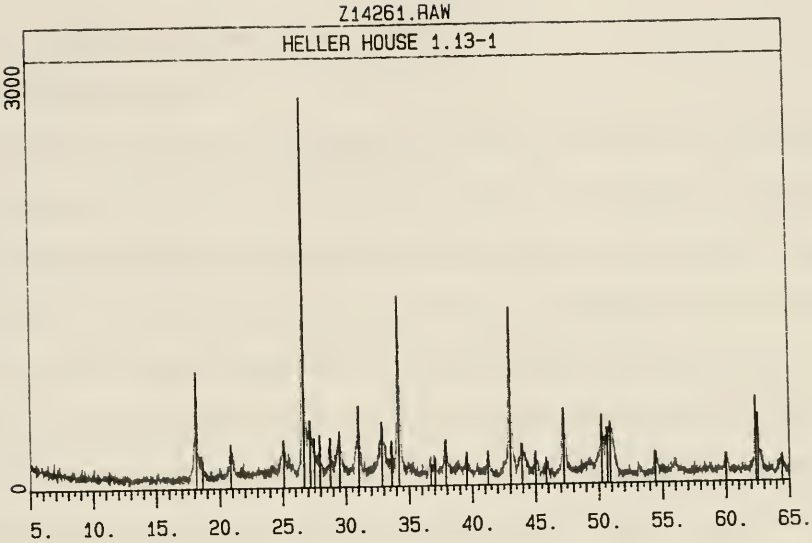


Figure 4.35 XRD Spectra of sample 1.13-1 indicates the presence of quartz, calcium hydroxide, dolomite, calcium carbonate, and many other possible materials in the binder. This is probably a lime-based plaster.

CHAPTER 5 CONCLUSIONS

5.1 Summary of Heller House Finishes

5.1.1 Original Plaster

There are two original plaster types evident in the Heller House. The rooms on the main axis of the first floor--the living room, hall, and dining room--were finished with sand-float plaster, while all other rooms except for the attic were done in a traditional gypsum finish coat. Research of original finishes of other early Wright houses reveals that that he often specified sand-float plaster. The treatment of the Heller House is interesting because Wright used the sand-float plaster type in the three public rooms of the main axis, while he used a traditional gypsum finish coat plaster in all of the peripheral rooms. Wright's preference for sand-float plaster indicated his use of different materials for the establishment of a hierarchical room order. The sand float plaster provides an interesting texture in conjunction with the original wall finishes.

5.5.2 Original Wall Paints

To identify the type of paint Wright originally used in the interior of the Heller House, the three primary rooms on the first floor were investigated for the identification of the paint binder. Analysis confirms that the walls of the main rooms of the first floor were originally finished with a distemper or water-based paint: The paint in the living room was found to be proteinaceous, probably either an animal glue or casein, the paint in the hall was bound with a starch, and

the paint in the dining room was bound with a gum. Original paint samples from these rooms, regardless of binder type, are matte and pigment rich, and display subtle color variability due to uneven pigment dispersion. The use of this pigment-rich, matte distemper paint in conjunction with the original sand-float plaster provided an effect dependent on high color variation and low surface reflectance. It is quite certain that the paint colors for these rooms were specified by Wright and were custom-made at the house. It is also possible that the house painters chose the binders for the paint, based on their knowledge of specific pigments and the surface effects that were desired. It is not known whether the paint in other rooms was custom-mixed or commercially prepared. Many of the original layers from these rooms have the same visual characteristics as the first floor paints, but they were not analyzed in great detail. (Figure 5.1 below.)

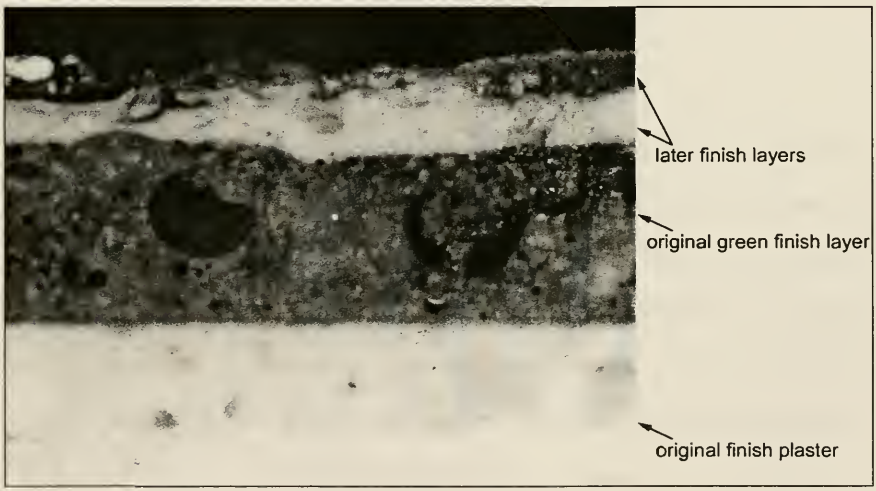


Figure 5.1 Cross-sectional photomicrograph of sample 2.12-1 from the second floor sewing room illustrating the similarities in composition and texture between original wall paint of the first and second floors. Magnification 50X.

5.1.3 Original Wall Pigments

The original paint layers in the living room, dining room, and hall were analyzed for pigment content. In general, earth pigments with some synthetics were identified. The living room finish is a mixture of yellow ochre, (composed of silica, alumina, and goethite) and Prussian blue (ferric ferrocyanide), the hall includes yellow ochre (yellow) and goethite (red), and the dining room paint contains burnt sienna (a dark red pigment). All of these pigments are iron-based pigments. Additionally, barite, or barium sulfate, was found through electron dot mapping of these samples. This pigment was probably used as a white filler or extender. Calcium was also evident during scanning electron microscopy, especially in the hall sample, and therefore whiting, or calcium carbonate, probably used as a filler or extender, was also a component of these distemper paints.

5.1.4 Wood Finishes

Evidence of beeswax was found in an isolated wood sample form the first floor bathroom door. If in fact this was the original finish in the entire house, as specified by Wright in his original drawing, the effect on the wood would be entirely different than it is today, with the later varnishing campaigns. The wood would be lighter in color, the graining would be more evident, and the relationship between the wood and all other finishes would be very different. In addition, there is evidence that many of the oak floors have been sanded.

The window sash in the living room and dining room was sampled for the identification of original finish. It was found that varnish was later applied to the interior sash of the windows in both rooms, altering the original effect of the green paint.

Exterior wood samples of the art glass casement window in the master bedroom (sample 2.01-1) and another bedroom (sample 2.05-2) revealed the original paint layer to be a light orange-beige over a primer. The current paint is much more yellow than the original finish.

5.1.5 Interior Color Schemes

It is important to note that the paint colors in the Heller House were matched with matte Munsell standards to small, isolated samples. Therefore, while the color selected is representative of the color in the sample, the original finish color may have varied slightly through a given room, especially given that some of these paints were custom-mixed on site.

The majority of the original paint colors used on the first floor of the Heller House were reds and oranges. (Table 4.1.) The exception to this is the living room, which was originally painted in green. In order to articulate the walls in the rooms, bronzing powder was used in both the living room and dining room. Additionally, in the living room, the area between the ceiling and the wall was painted in a yellow ochre paint. Though the original distemper wall paint in the living room

was matte and densely pigmented, there is evidence of quartz added to this finish, producing a subtle reflectance to the wall surfaces. The hall was finished in order to establish a connection between the living room and dining room since the living room and dining room colors, green and red, were used in areas of the hall.

Original paint colors were not found for the main kitchen, though the servants' dining room, connected to the kitchen, was a dark red, much darker than the dining room paint. The interior wood sash in the living room and dining room was dark green, in harmony with the living room color and in contrast with the dining room.

On the second floor, the colors are generally lighter and unsaturated. A variety of colors were used, including light blue-green in the master bedroom (2.01), a light red-orange in another bedroom (2.05), and a yellow-green in the sewing room (2.12). It is likely that each of the second-floor rooms were painted in a different color. Many of these original layers were higher in reflectance and gloss and pigments were more evenly dispersed than in the first floor paints. The second floor hall was finished in a different color than the first floor hall, and the transition between the two colors occurs at the picture rail on the main stairs. The first floor hall was a light yellow-orange while the second floor hall is orange with much more red in it. (Table 4.1.) The attic was originally finished in a green over sand-float plaster in the hall and bedrooms. There is evidence of bead board originally

in the play room. The windows on the east of the attic were originally finished in dark green over a primer.

5.1.6 Later Finish Layers

Many of the samples extracted form the Heller house included many layers of paint. Though later layers were not studied in detail, certain characteristic emerged in many of the rooms. A layer of canvas was paced in many of the rooms early in the Heller House history, perhaps to obscure cracks of failing finishes. In the stratigraphy, the canvas is the second layer, directly after the original finish. Many of the rooms have evidence of many layers of white and beige, soon after the original finish.

For example, in the living room, the stratigraphy includes original green, canvas layer, later green, and may layers of white. Interestingly, many of the second floor bedrooms exhibit many--upwards of 25--layers of paint. In addition to wall finishes, the wooden elements have been refinished. There is evidence of sanding of many of the floors and varnishing and painting of wood trim and doors.

5.1.7 Wright's Intentions

According to his drawing, Wright's original intent for the Heller House was for the interior walls to be of rough sand finish and it was found that the main rooms on the first floor and attic were in fact finished with this technique. Wright intended

the house to be trimmed in quartered and waxed white oak. From the analysis conducted in this study, it can be stated that the original wood finish was probably carried out, as evidenced by the discovery of beeswax on sample 1.14-1. The trim has evidence of later darker varnish finishes that obscure this original intent. According to Wright, the plaster was to be saturated with pure color. Analysis of the original wall finishes found that the paints were densely pigmented, and the original colors were strong earth tones. Wright intended the interior color scheme to be bronze and dull green. This color scheme was executed in the living room, while the other spaces were finished in many different colors.

5.2 Recommendations for Restoration

In order to experience the full effect of Wright's design concepts for the the interior of the Heller House, the original finishes—especially in the first floor public rooms—should be restored. For this to be accomplished, the original sand-float plaster in the living room, dining room, and hall, currently lost under many layers of paint, must be uncovered. For the paint replication, an number of paint companies exist that specialize in the formulation of traditional distemper paints. These include *Farrow & Ball* and *Rose of Jherico*, both located in England.[1] The soft distemper available through *Rose of Jherico* contains titrated calcium carbonate, dehydrated animal skin glue, and traditional pigments.[2] The soft

[1] Mary Culver provided information about these companies.
[2] From specification sheet for *Rose of Jherico* soft distemper.

distemper available through Farrow & Ball is a water dispersion of pigments in a cellulose glue and natural resin binder dispersed in water.[3] Client specified colors are available through these companies.

Another option would be the preparation of the finishes on-site by a restoration painter. The components of the paint, including pigments, glue, and whiting, can be acquired through paint material and pigment companies, such as Kremer Pigments, located in New York City. If the original effect of the living room surface with the reflective quartz particles is to be replicated, on-site preparation is required.

Wood trim is a large and significant component of the interior finishing scheme of the Heller House. Since these surfaces contain evidence of varnish layers, refinishing tests must be conducted to establish the safest method, these layers should be removed in-situ, and the wood should be finished with a durable wax finish, such as carnauba wax.

5.3 Recommendations for Further Study

The study of the interior finished of the Heller House is no small task. With more time, resources, and visits to the house, further study could continue in many areas. These areas would include a more extensive literature survey of turn-of-the-century paint formulas. The three original paints studied in the first floor of the

[3] From specification sheet for *Farrow & Ball* soft distemper.

Heller House had different binders. It would be interesting to know how common starch and gum were used as custom binders in water-soluble distemper paints.

Some previous owners of the house are still alive and could offer their recollections of the interior. This might provide further information regarding dates of finish campaigns.

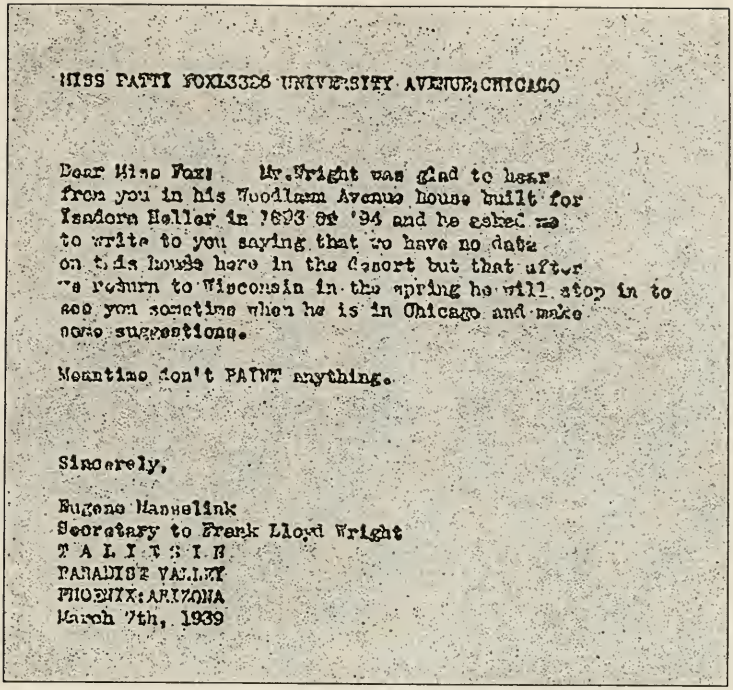
While many finishes analyses of Wright houses were studied, there have been a number of houses investigated for paint finishes that have not been mentioned or studied during this report. In time, a database of all finish information of Wright houses should be compiled. As a part of the recommendations for the restoration of the Heller House, it would be helpful to survey all Wright houses that have been restored, in order to be familiar with the modern solutions for replication of original finishes. Throughout the study, a number of significant steps in documentation have been taken to ensure a record of the original fabric of the house. These steps should be included in the guidelines for the conservation of Frank Lloyd Wright houses so that original finish investigations are sufficiently documented.

Finally, there is significant information regarding the kitchen in the form of a cassette tape recorded by George Watson, a former owner. This information should be interpreted and plans of the original kitchen should be constructed. Additionally, twelve finish samples were removed from the porch during the site

visit, in the hopes of identifying its relative date of construction. Though these samples were not analyzed die to time constraints, they are preserved and photomicrographs have been taken so that this analysis can be completed in the future.

APPENDIX A

Archival Information



MISS PATTI FOX1338 UNIVERSITY AVENUE:CHICAGO

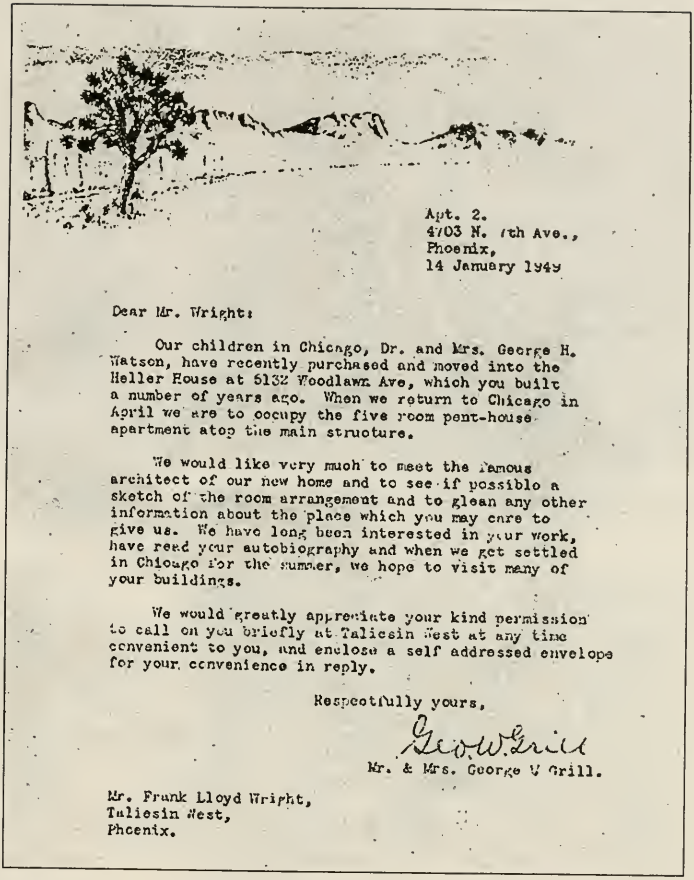
Dear Miss Fox: Mr.Wright was glad to hear from you in his Woodlawn Avenue house built for Isadora Heller in 1893 or '94 and he asked me to write to you saying that we have no data on this house here in the desert but that after we return to Wisconsin in the spring he will stop in to see you sometime when he is in Chicago and make some suggestions.

Meantime don't PAINT anything.

Sincerely,

Eugene Masselink
Secretary to Frank Lloyd Wright
T A L I E S I N
PARADISE VALLEY
PHOENIX:ARIZONA
March 7th, 1939

Figure A.1 1939 letter from the secretary to Frank Lloyd Wright to Miss Patti Fox, owner of the Heller House. Courtesy of the Frank Lloyd Wright Archives.



Apt. 2.
4703 N. 7th Ave.,
Phoenix,
14 January 1949

Dear Mr. Wright:

Our children in Chicago, Dr. and Mrs. George H. Watson, have recently purchased and moved into the Heller House at 5132 Woodlawn Ave, which you built a number of years ago. When we return to Chicago in April we are to occupy the five room pent-house apartment atop the main structure.

We would like very much to meet the famous architect of our new home and to see if possible a sketch of the room arrangement and to glean any other information about the place which you may care to give us. We have long been interested in your work, have read your autobiography and when we get settled in Chicago for the summer, we hope to visit many of your buildings.

We would greatly appreciate your kind permission to call on you briefly at Taliesin West at any time convenient to you, and enclose a self addressed envelope for your convenience in reply.

Respectfully yours,

Geo. W. Grill

Mr. & Mrs. George W. Grill.

Mr. Frank Lloyd Wright,
Taliesin West,
Phoenix.

Figure A.2 1949 Letter from Mr. and Mrs. George W. Grill to Frank Lloyd Wright requesting a meeting. Courtesy of the Getty Research Institute Archives.

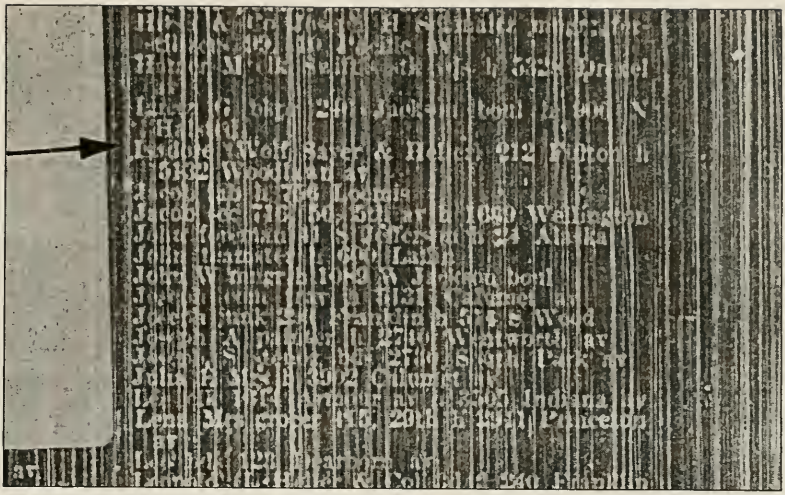


Figure A.3 1901 Chicago City Directory lists Isidore Heller's home and business address.

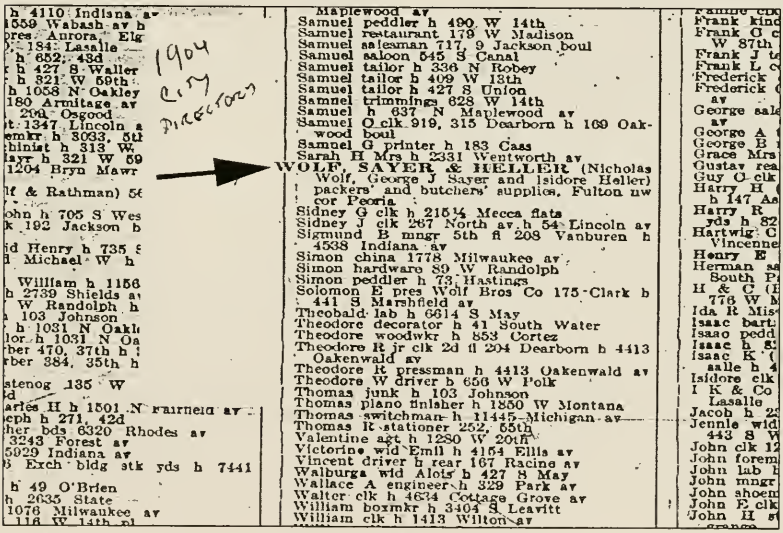


Figure A.4 1904 Chicago City Directory. Isidore Heller's was part owner of Wolf, Sayer, & Heller packers' and butcher's supplies.

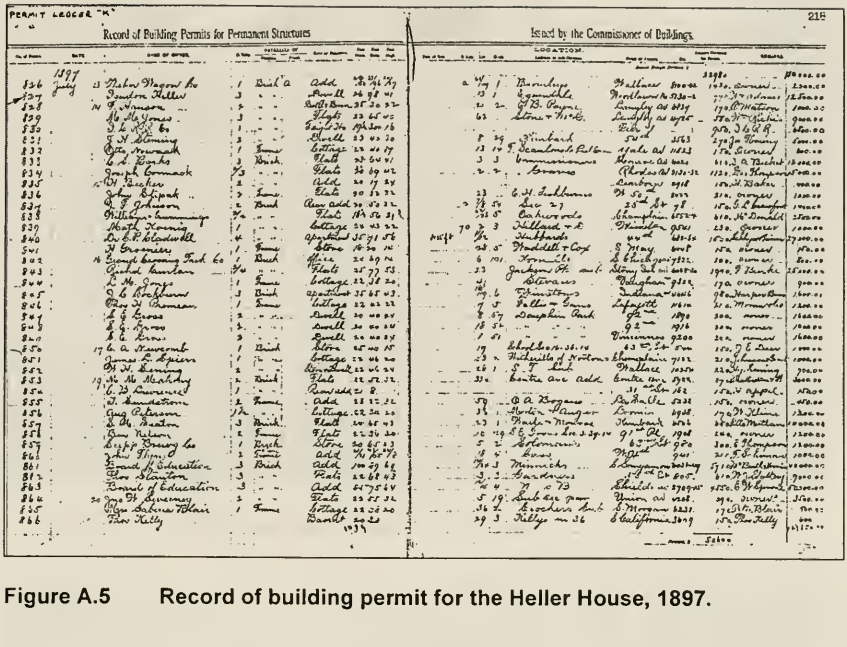
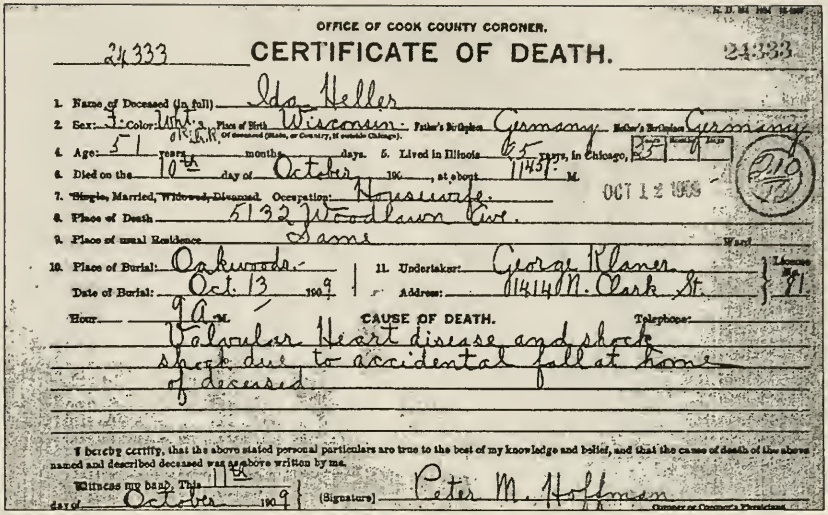


Figure A.5 Record of building permit for the Heller House, 1897.



OFFICE OF COOK COUNTY CORONER.

24333 CERTIFICATE OF DEATH. 24333

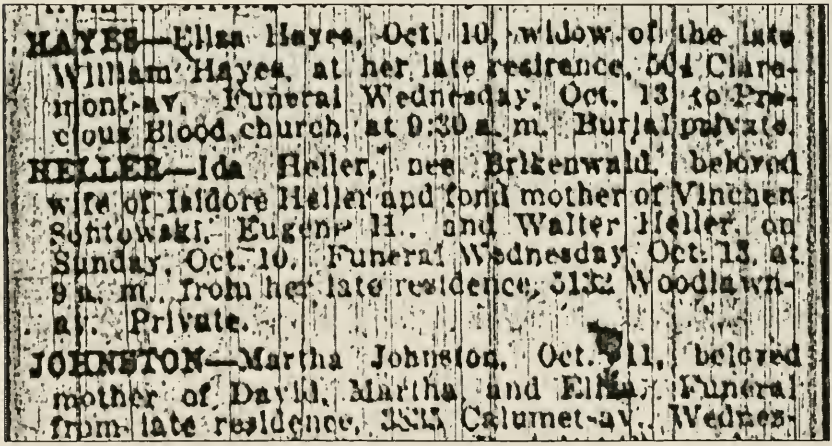
1. Name of Deceased (in full) Ida Heller
2. Sex: F Color: White 3. Place of Birth (State or Country) Wisconsin Father's Birthplace Germany Mother's Birthplace Germany
4. Age: 51 years months days. 5. Lived in Illinois 65 years, in Chicago, 65 years
6. Died on the 10th day of October 1909, at about 11:45 P.M.
7. Single, Married, Widowed, Divorced. Occupation: Housewife.
8. Place of Death 5132 Woodlawn Ave.
9. Place of usual Residence Same Ward
10. Place of Burial: Oakwoods. Date of Burial: Oct. 13 1909 Hour 9 A.M.
11. Undertaker: George Klaner Address: 1414 N. Clark St. License No. 71
CAUSE OF DEATH. Telephone:
Valvular Heart disease and shock due to accidental fall at home of deceased

OCT 12 1909

I hereby certify, that the above stated personal particulars are true to the best of my knowledge and belief, and that the cause of death of the above named and described deceased was as above written by me.

Witness my hand, This 11th day of October 1909 (Signature) Peter M. Hoffman Coroner or Coroner's Physician

Figure A.6 1909 Death Certificate for Ida Heller



HAYES—Ellen Hayes, Oct. 10, widow of the late William Hayes, at her late residence, 604 Clarmont-av. Funeral Wednesday, Oct. 13 to Precious Blood church, at 9:30 a. m. Burial private.

HELLER—Ida Heller, nee Brikenwald, beloved wife of Isidore Heller and fond mother of Vincheneo Witowski, Eugene H., and Walter Heller, on Sunday, Oct. 10. Funeral Wednesday, Oct. 13, at 9 a. m., from her late residence, 5132 Woodlawn-av. Private.

JOHNSTON—Martha Johnston, Oct. 11, beloved mother of David, Martha, and Ella. Funeral from late residence, 3313 Calumet-av., Wednes-

Figure A.7 Obituary for Ida Heller

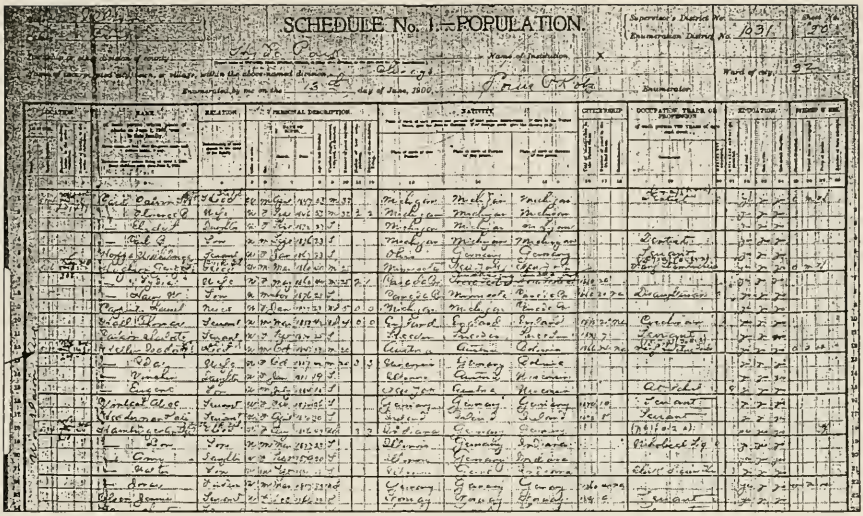


Figure A.8 1900 Census data from Woodlawn Avenue

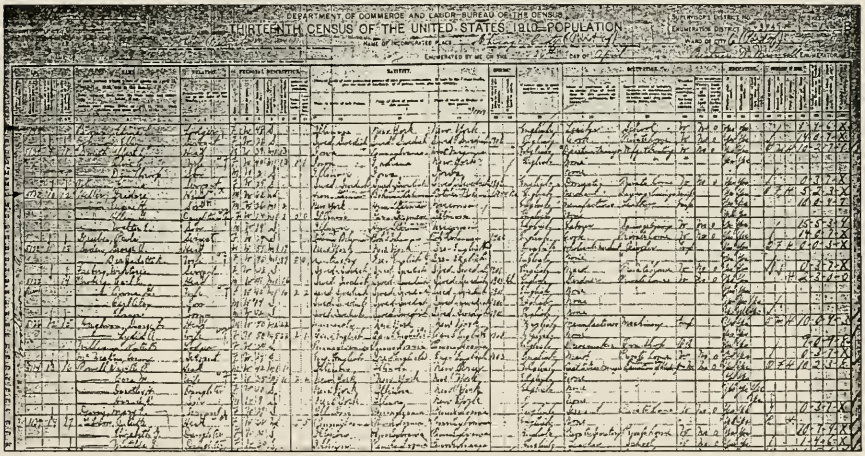


Figure A.9 1910 Census Data from Woodlawn Avenue

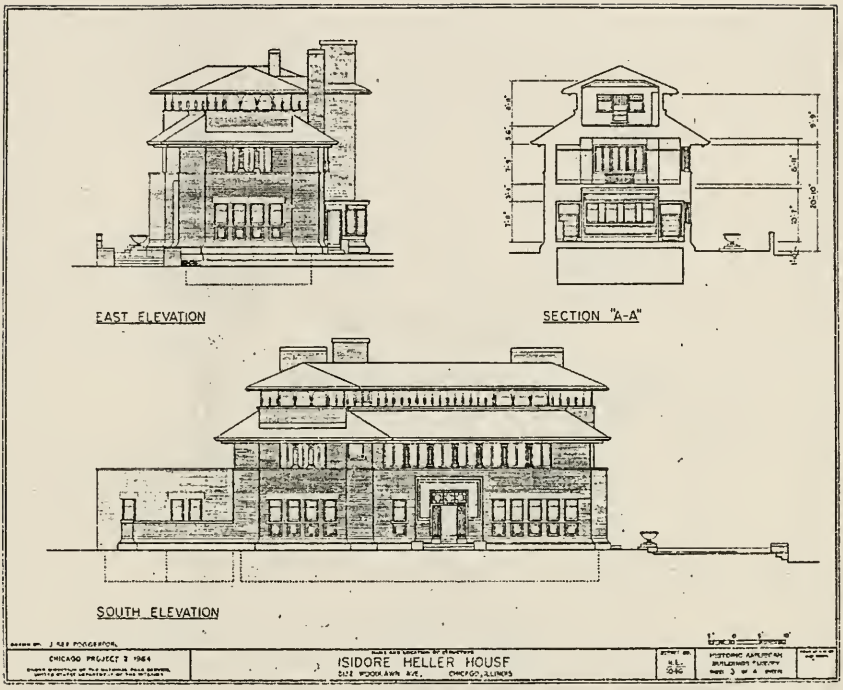


Figure A.10 1956 Historic American Building Survey drawings of the Heller House.

APPENDIX B

Cross-sectional Photomicrographs

VESTIBULE

1.01

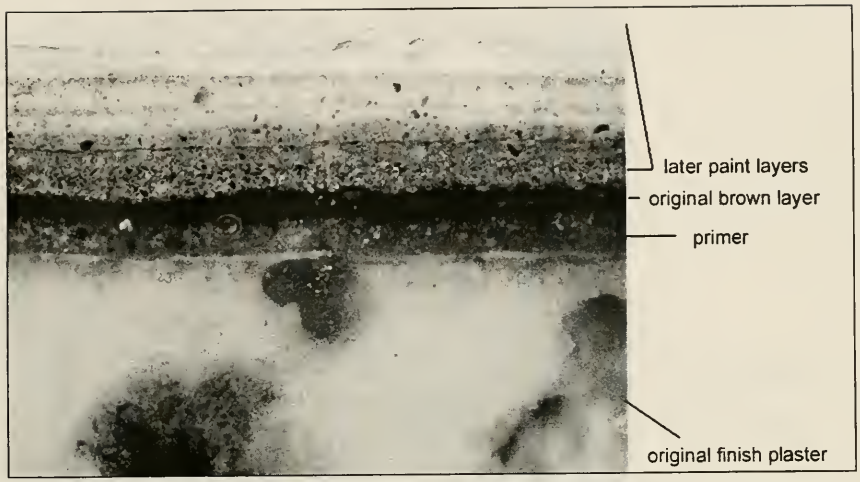


Figure B.1 Cross-sectional photomicrograph of sample 1.01-6 illustrating original brown paint over a yellow primer in the vestibule. Magnification 25X.

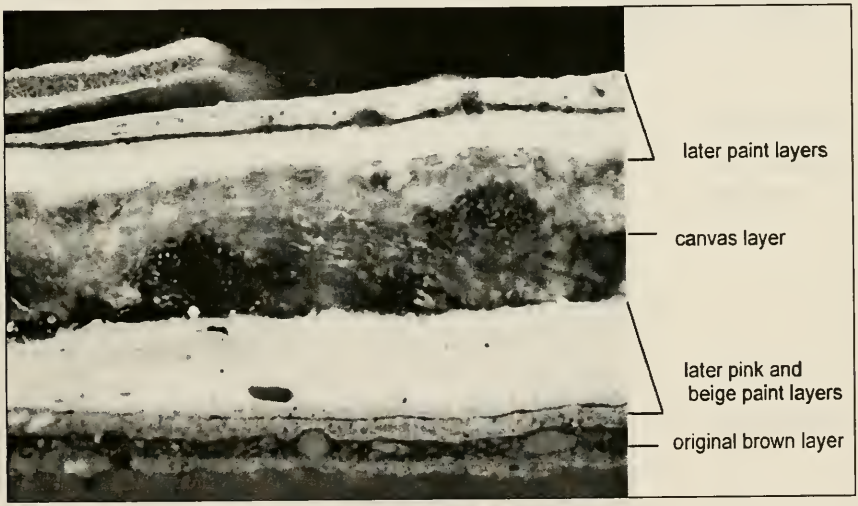


Figure B.2 Cross-sectional photomicrograph of sample 1.01-6 illustrating original and subsequent paint and canvas layers in the vestibule. Mag. 25X.

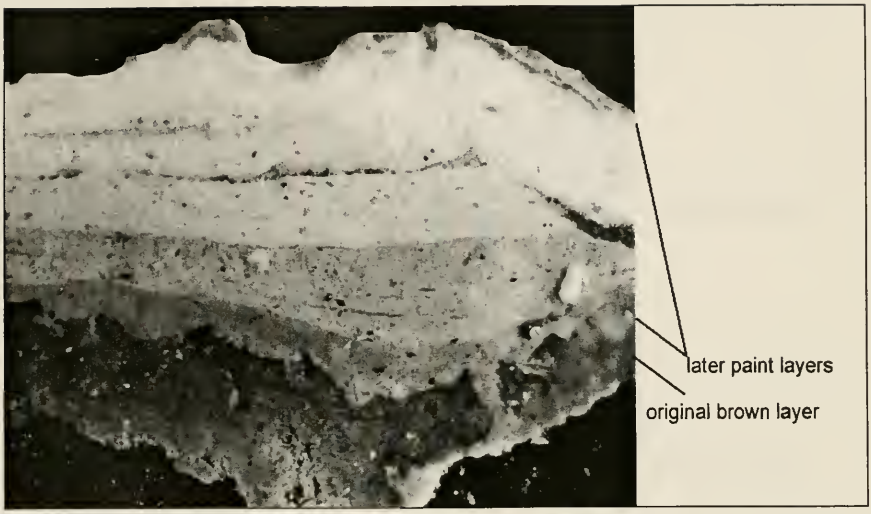


Figure B.3 Cross-sectional photomicrograph of sample 1.02-4 illustrating original and subsequent paint layers in the reception room. Magnification 50X.

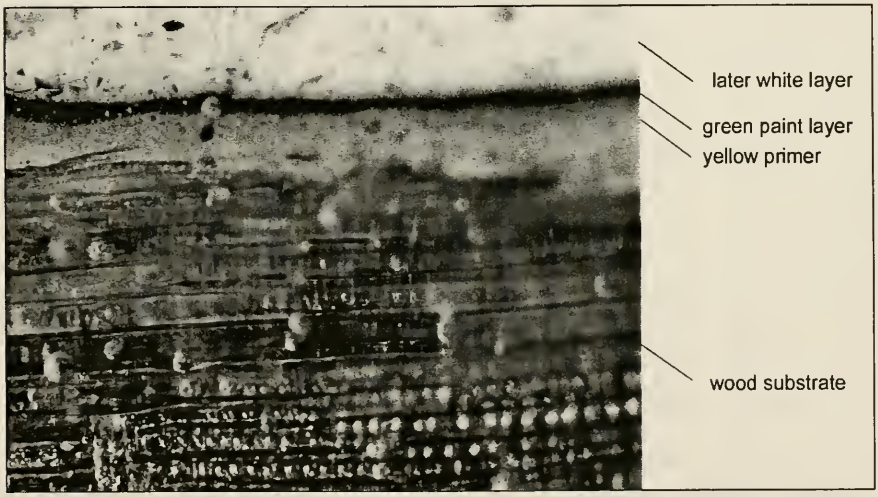


Figure Cross-sectional photomicrograph of sample 1.02-2 illustrating early green paint layer and later white paint layer on the window sash in the reception room. Magnification 25X.

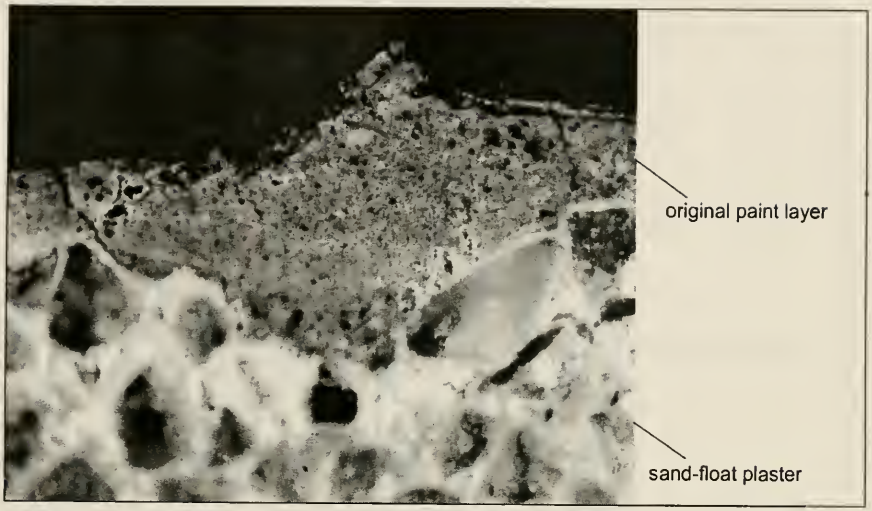


Figure B.5 Cross-sectional photomicrograph of sample 1.03-2 illustrating original sand-float plaster and original paint layer in the hall. Magnification 50X.

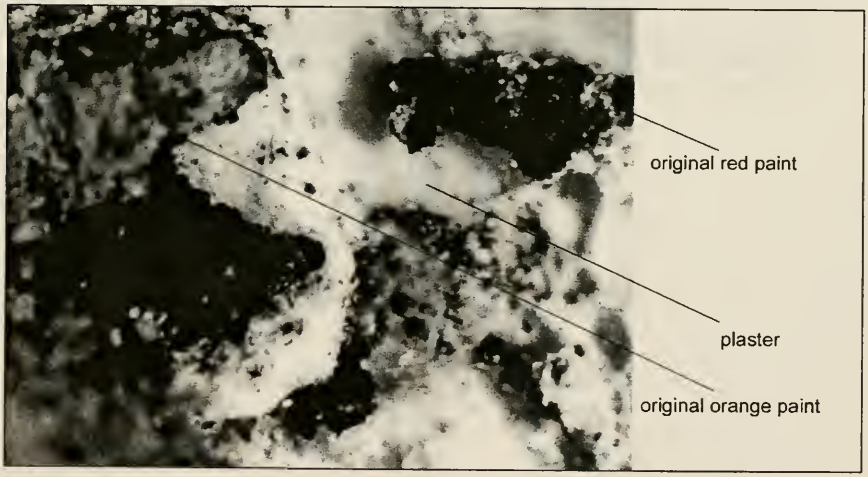


Figure B.6 Photomicrograph of sample 1.03-4 illustrating original red paint layer over orange paint in the southwest wall panel in the hall. It is believed that the red finish was added originally to complement the adjoining dining room. Magnification 50X.

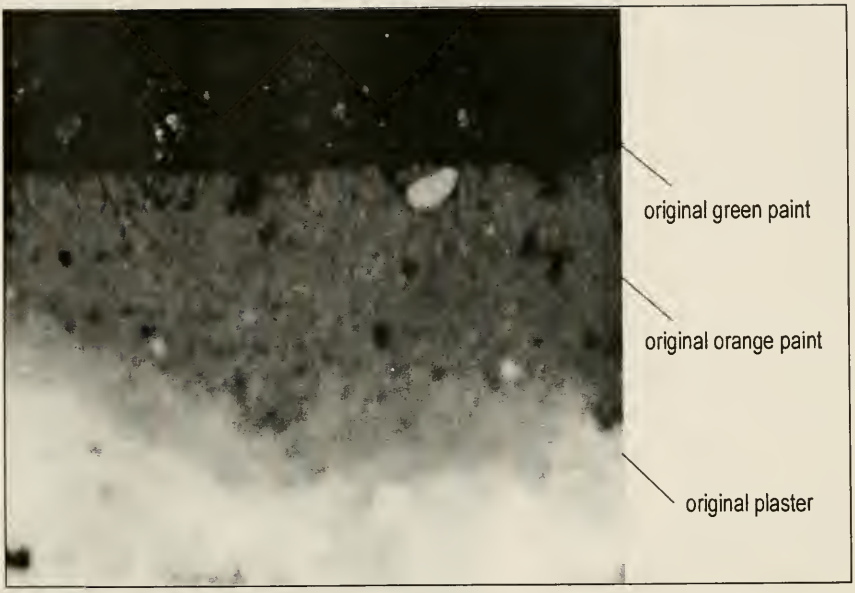


Figure B.7 Cross-sectional photomicrograph of sample 1.03-5 illustrating original green finish over the orange finish on the southeast wall panel in the hall. The same green finish was used in the adjoining living room. Mag. 50X.

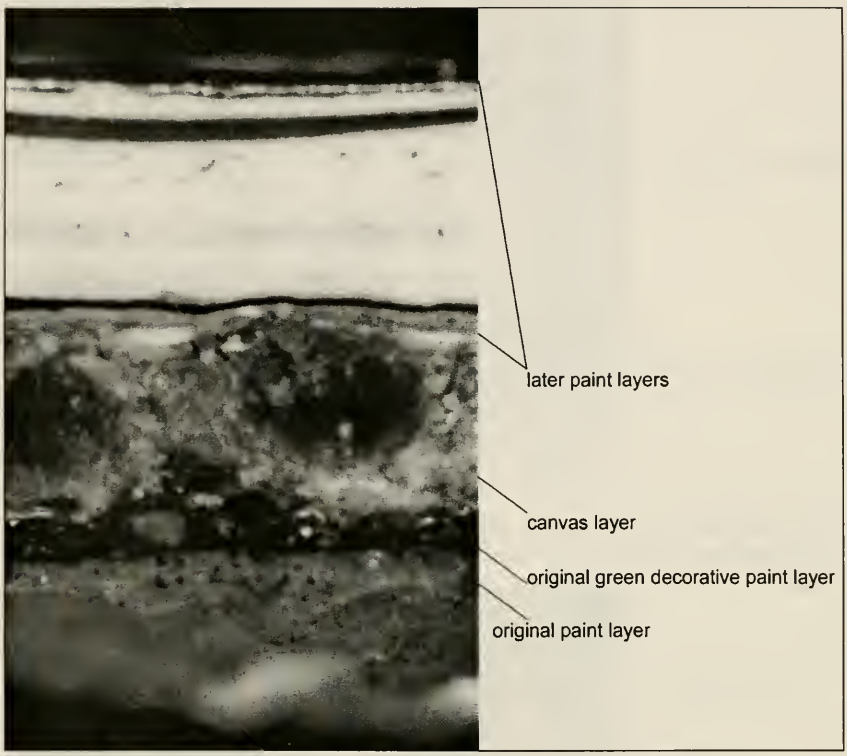


Figure B.8 Cross-sectional photomicrograph of sample 1.03-5 illustrating all paint and canvas layers from the southeast wall panel in the hall. Mag. 25X.

LIVING ROOM

1.04

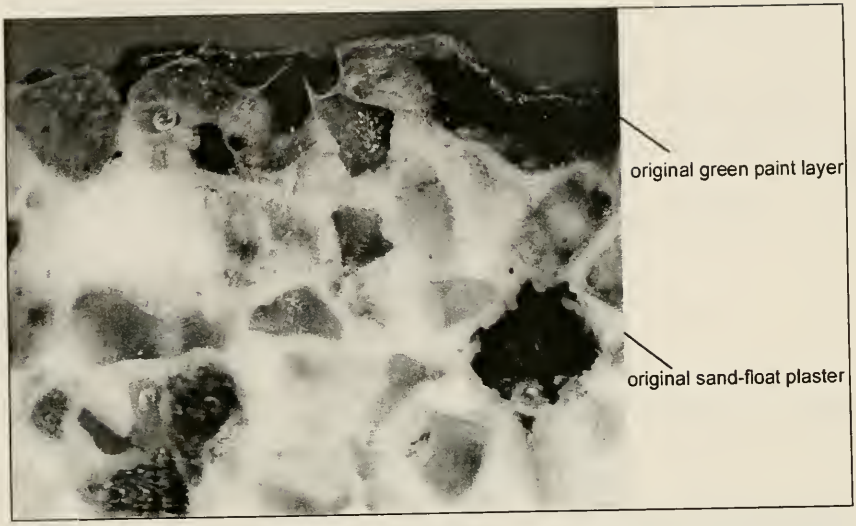


Figure B.9 Cross-sectional photomicrograph of sample 1.04-1 illustrating the original sand-float plaster and original paint layer in the living room. Mag. 50X.

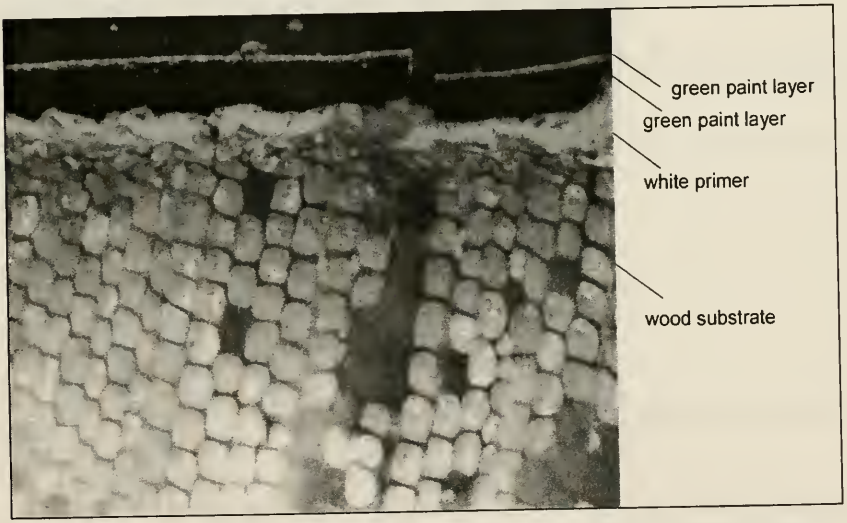


Figure B.10 Cross-sectional photomicrograph of sample 1.04-2 illustrating the original green paint layers on the window sash in the living room. Mag. 50X.

LIVING ROOM

1.04

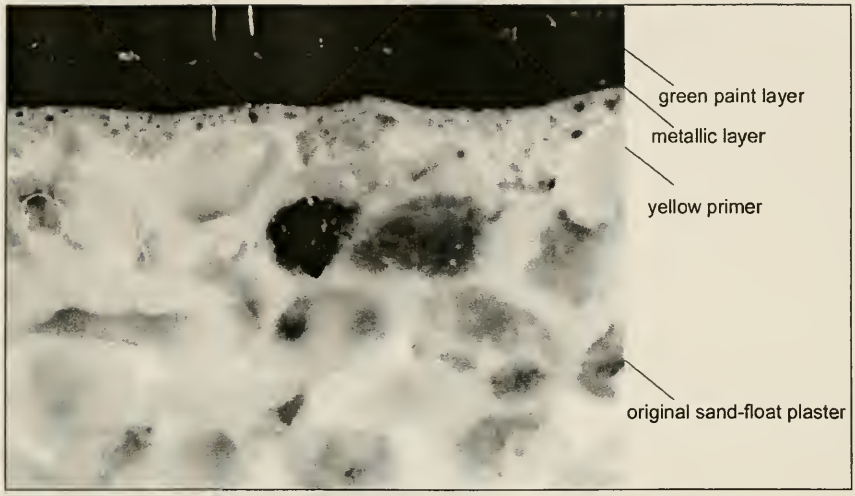


Figure B.11 Cross-sectional photomicrograph of sample 1.04-6 illustrating original bronzing powder used between wood bands in living room. Mag. 50X.

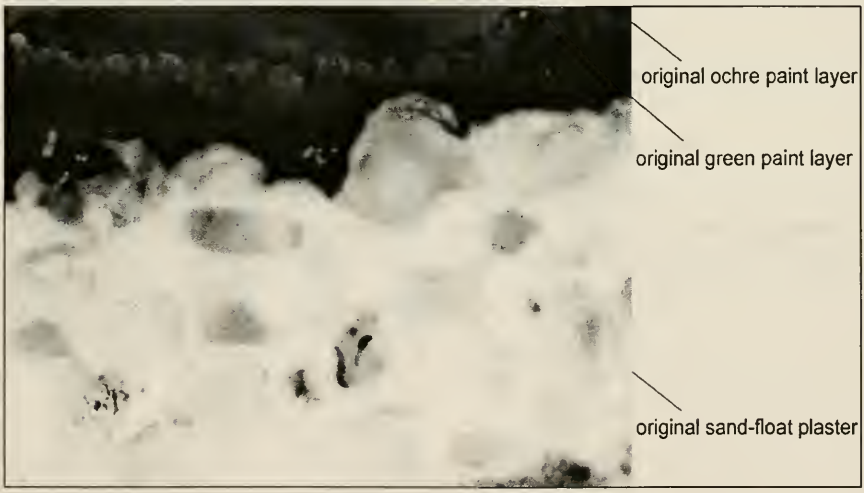


Figure B.12 Cross-sectional photomicrograph of sample 1.04-7 illustrating original ochre paint layer from living room banding between wall and ceiling. Magnification 50X.

LIVING ROOM

1.04

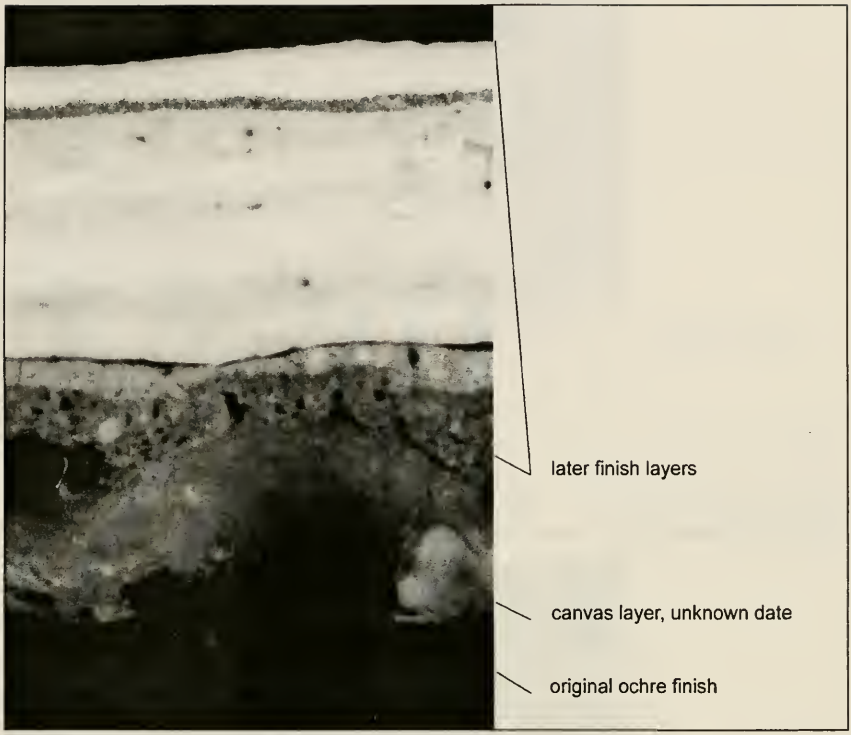


Figure B.13 Cross-sectional photomicrograph of sample 1.04-7 illustrating original ochre paint layer and subsequent paint and canvas layers in the living room. Magnification 25X.

SERVANT HALL

1.08

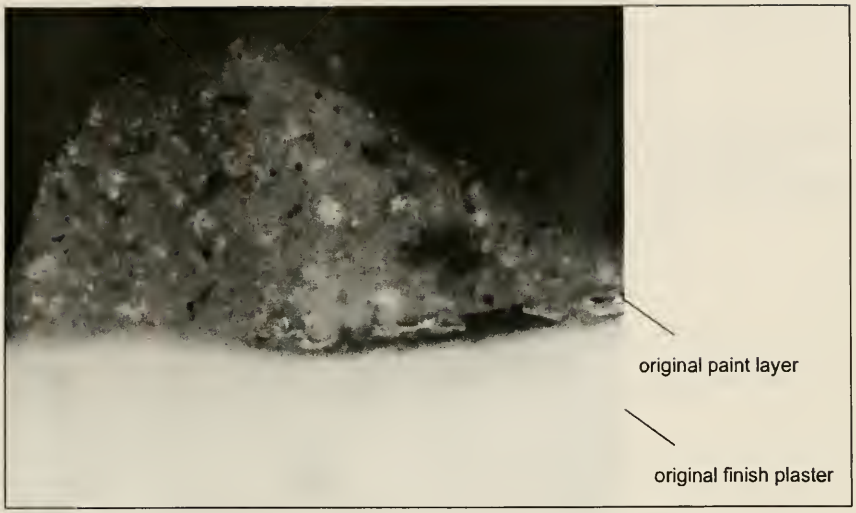


Figure B.14 Cross-sectional photomicrograph of sample 1.08-1 illustrating original red-orange paint layer and plaster in the servant hall. Magnification 50X.

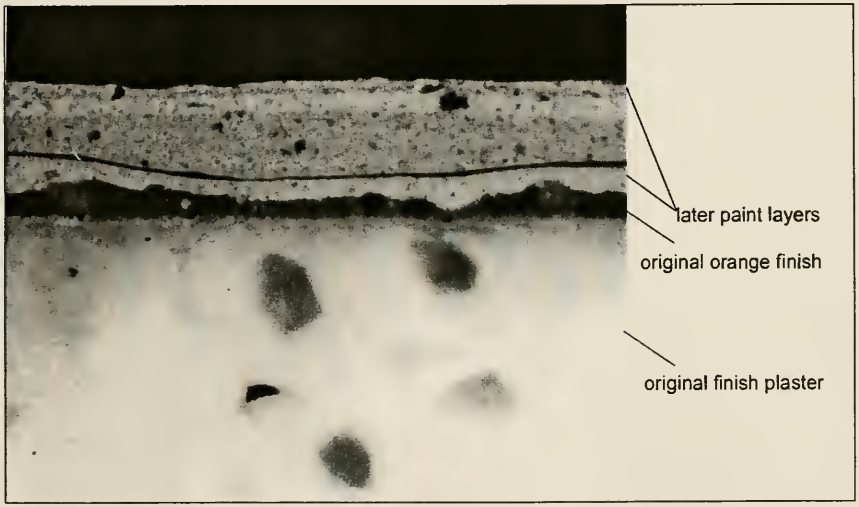


Figure B.15 Cross-sectional photomicrograph of sample 1.08-5 illustrating original plaster and original and later paint layers in the hall closet. Mag. 25X.

SERVANTS' DINING ROOM

1.09

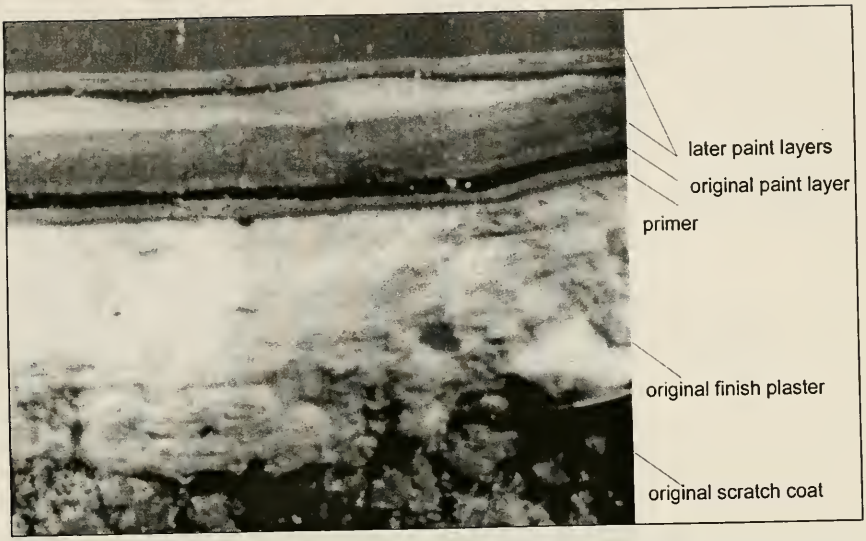


Figure B.16 Cross-sectional photomicrograph of sample 1.09-3 illustrating original plaster and dark red paint in the servants' dining room. Mag. 25X.

PANTRY

1.11

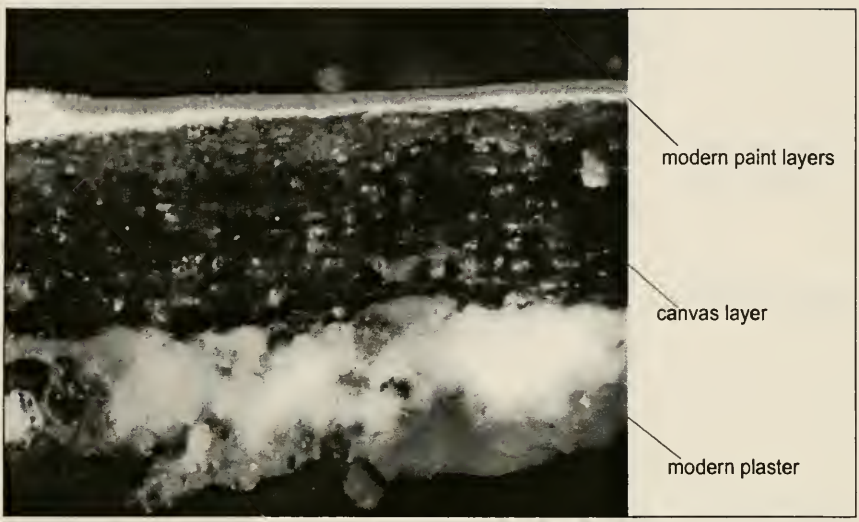


Figure B.17 Cross-sectional photomicrograph of sample 1.11-1 illustrating recent finish layers in the pantry. Magnification 50X.

DINING ROOM

1.12

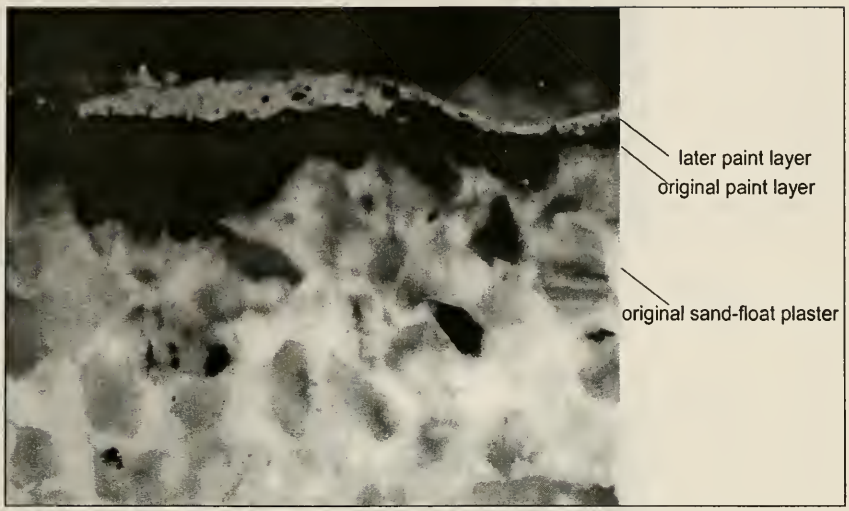


Figure B.18 Cross-sectional photomicrograph of sample 1.12-1 illustrating original sand-float plaster and original red paint layer. Magnification 50X.

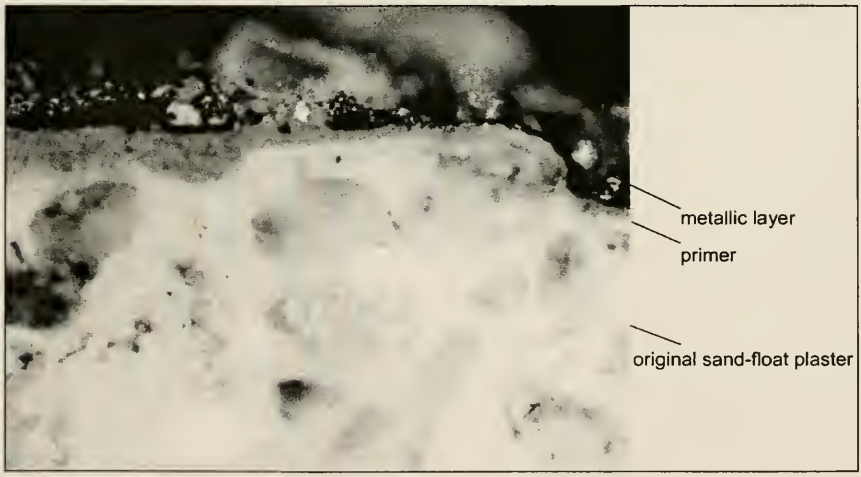


Figure B.19 Cross-sectional photomicrograph of sample 1.12-5 illustrating the bronzing powder originally located between wood bands in the dining room alcove. Magnification 50X.

DINING ROOM

1.12

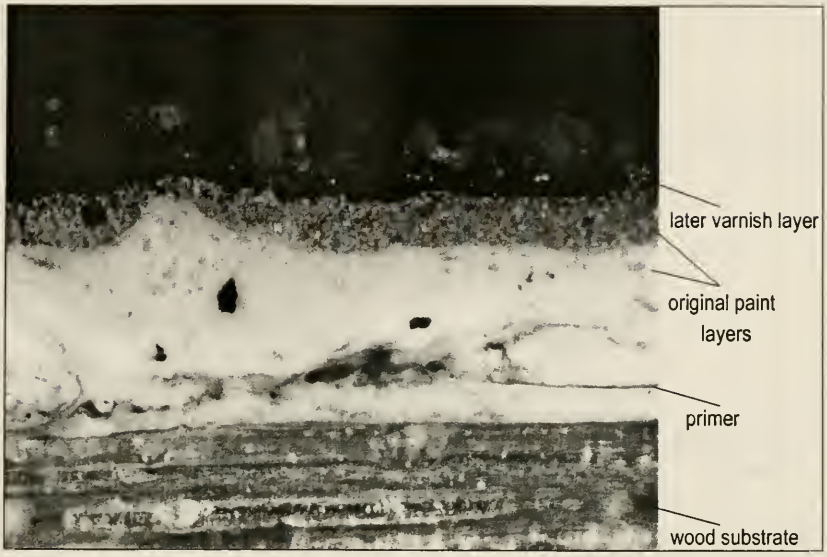


Figure B.20 Cross-sectional photomicrograph illustrating original green paint layers of dining room window sash. Note later varnish layer. Magnification 50X.

TELEPHONE ROOM

1.13

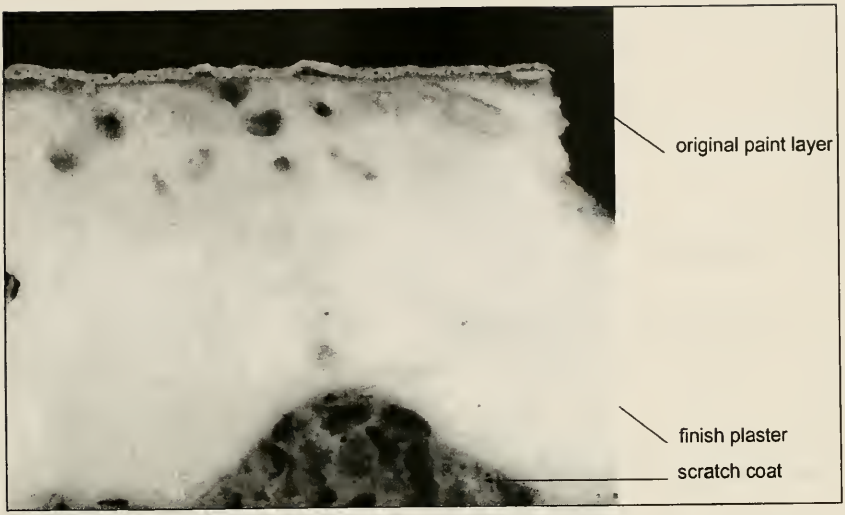


Figure B.21 Cross-sectional photomicrograph of sample 1.13-1 illustrating original scratch coat, finish coat, and paint layer in the telephone room. Mag. 25X.

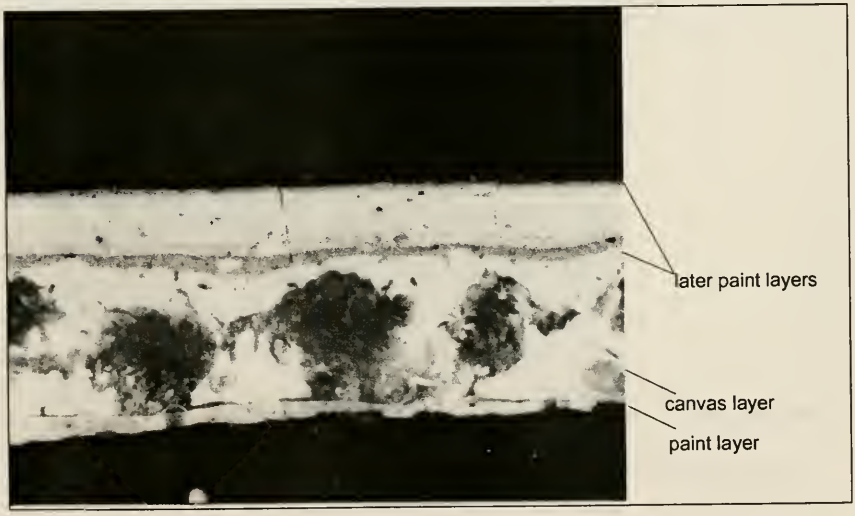


Figure B.22 Cross-sectional photomicrograph of sample 1.13-1 illustrating later paint and canvas layers in the telephone room. Magnification 25X.

ELEVATOR HALL

1.14

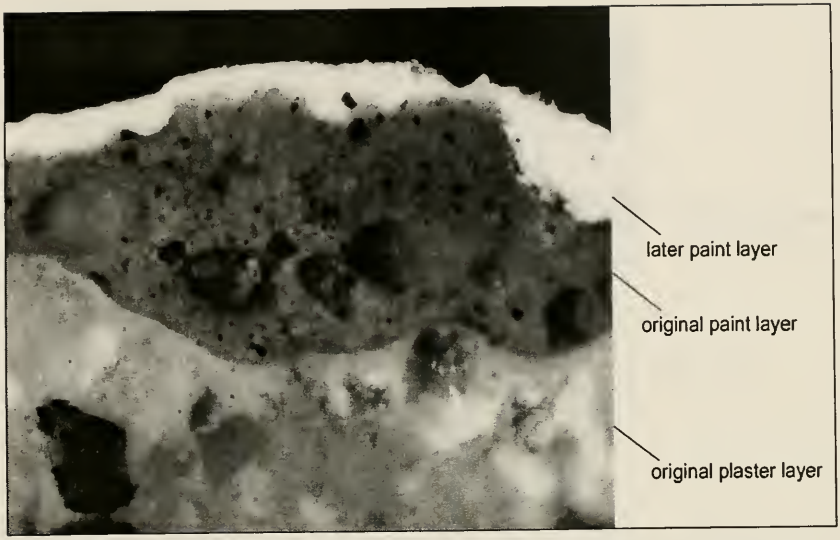


Figure B.23 Cross-sectional photomicrograph of sample 1.14-3 illustrating original orange-red paint layer in elevator hall. Magnification 50X.

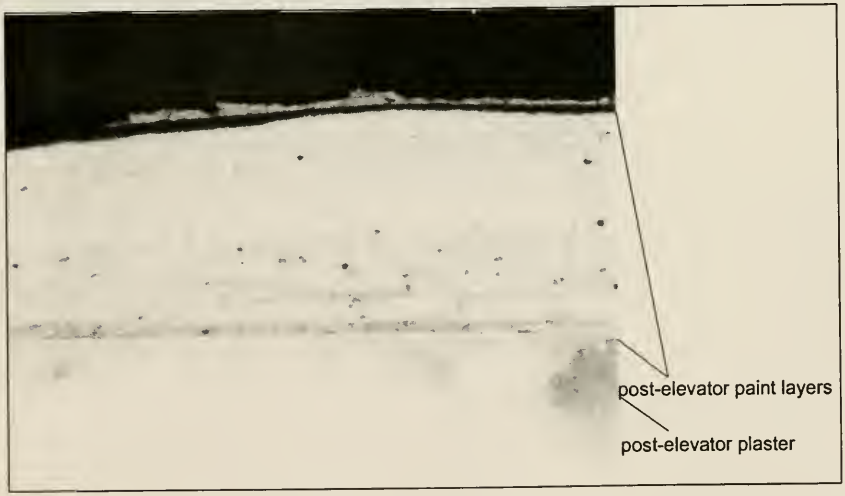


Figure B. 24 Cross-sectional photomicrograph of sample 1.14-2 illustrating plaster and original paint from date of elevator addition. Magnification 25X.

BATHROOM

1.15

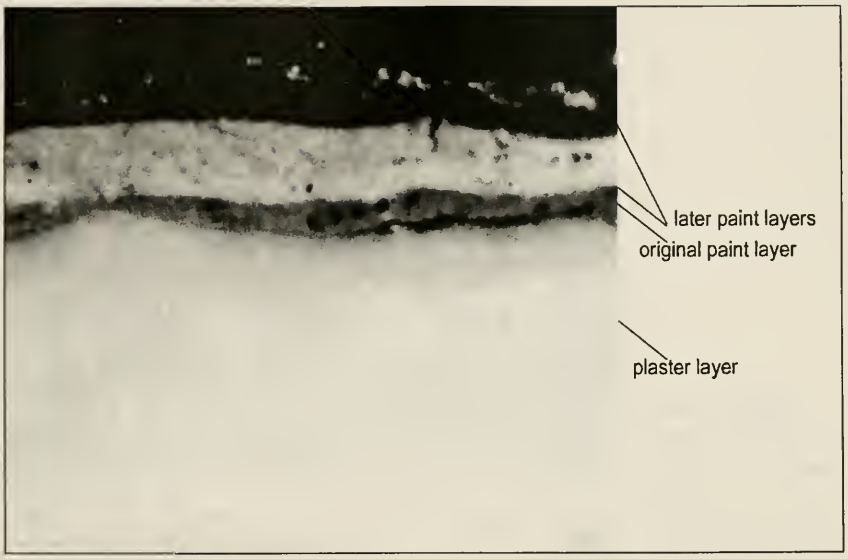


Figure B.25 Cross-sectional photomicrograph of sample 1.15-1 illustrating original orange paint layer in first floor bathroom. Magnification 50X.

MASTER BEDROOM

2.01

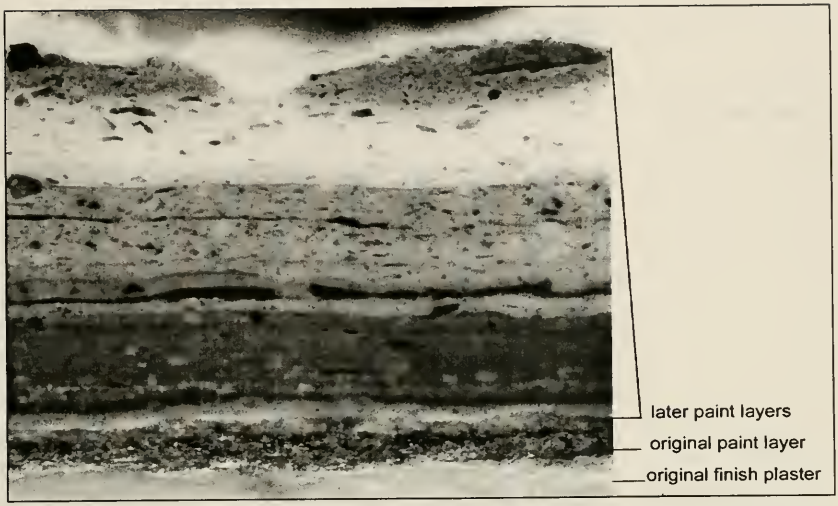


Figure B.26 Cross-sectional photomicrograph of sample 2.01-2 illustrating original and subsequent paint layers in the master bedroom. Magnification 25X.

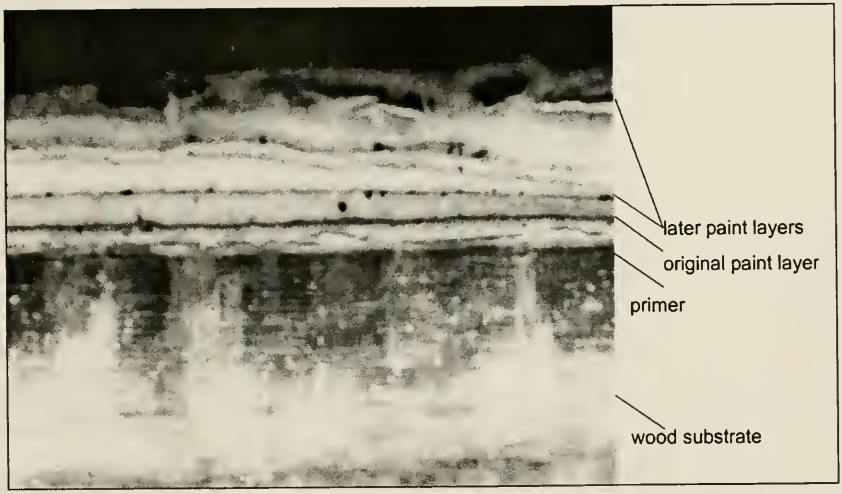


Figure B.27 Cross-sectional photomicrograph of sample 2.01-1 illustrating original and subsequent paint layers in the master bedroom art glass window sash. Magnification 25X.

BEDROOM

2.04

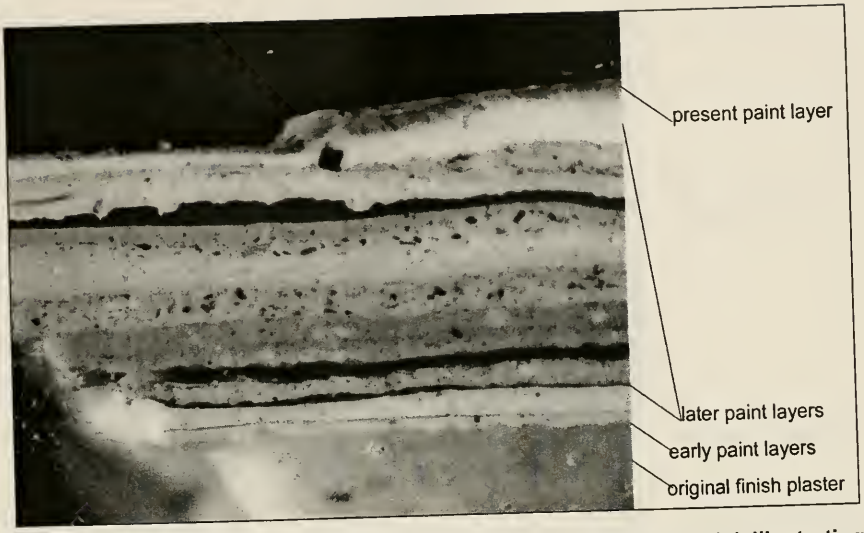


Figure B.28 Cross-sectional photomicrograph of sample 2.04-1 illustrating early and subsequent paint layers in bedroom 2.04. Magnification 25X.

BEDROOM

2.05

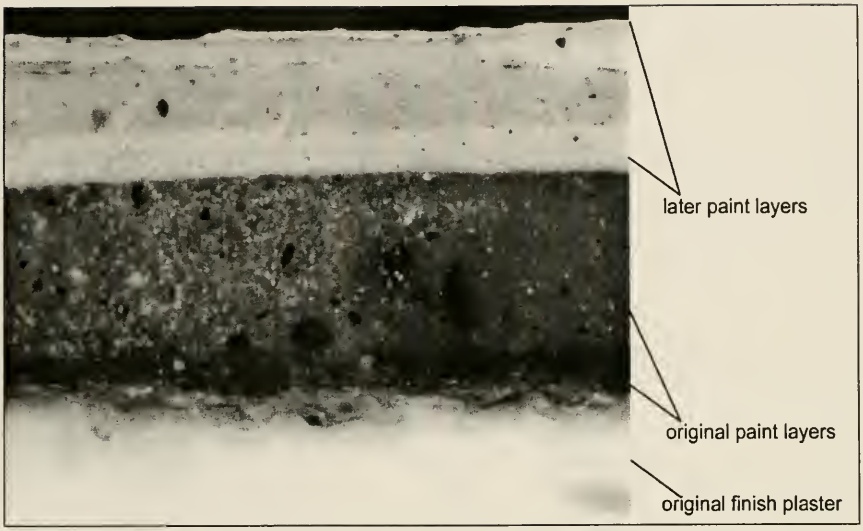


Figure B. 29 Cross-sectional photomicrograph of sample 2.05-4 illustrating the original plaster and paint layers in bedroom 2.05. Magnification 50X.

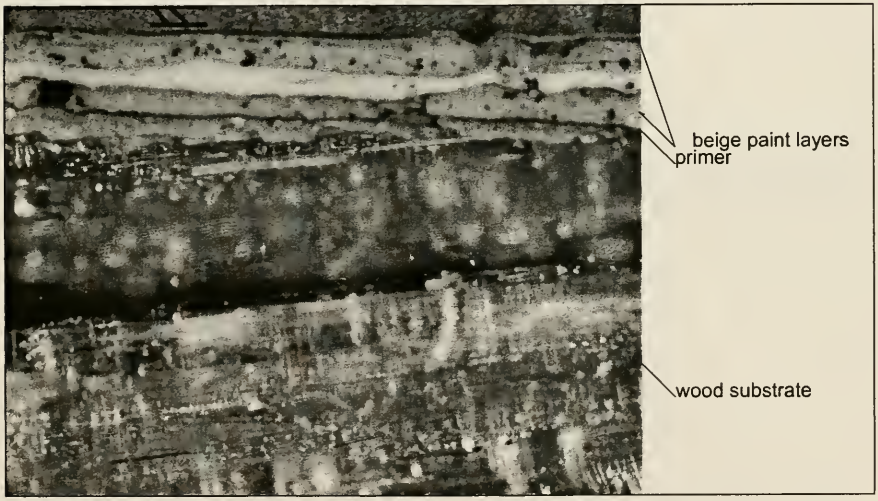


Figure B.30 Cross-sectional photomicrograph of sample 2.05-2 illustrating primer and 5 beige paint layers on the bedroom window exterior. Mag. 25X.

BEDROOM

2.05

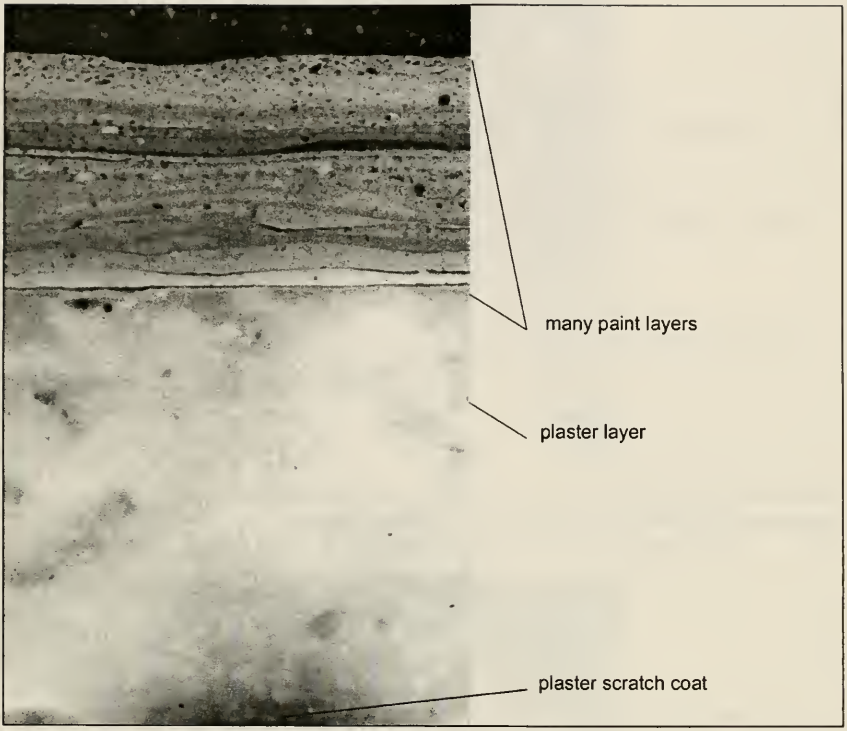


Figure B.31 Cross-sectional photomicrograph of sample 2.05-1 illustrating many paint layers in bedroom 2.05. The original finish is not present in this sample. Magnification 25X.

UPSTAIRS HALL

2.06

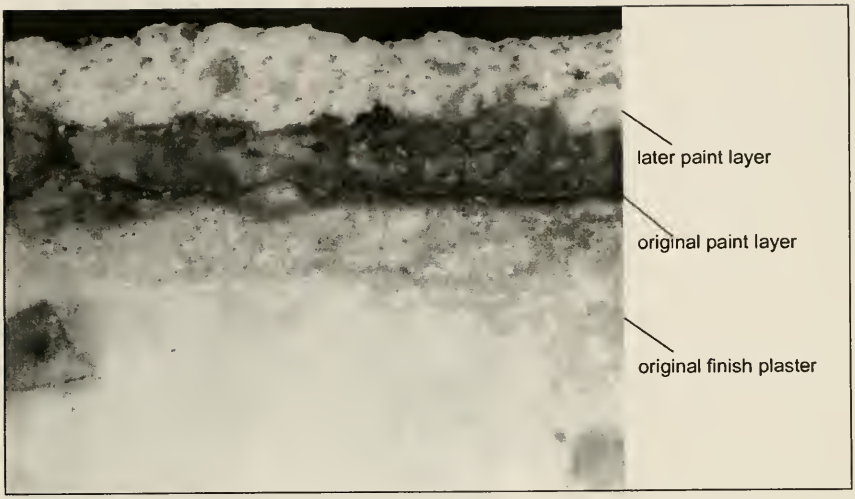


Figure B.32 Cross-sectional photomicrograph of sample 2.06-1 illustrating the original plaster and red-orange paint in the upstairs hall. Note the treatment is different than the downstairs hall (sample 1.03-2). Magnification 50X.

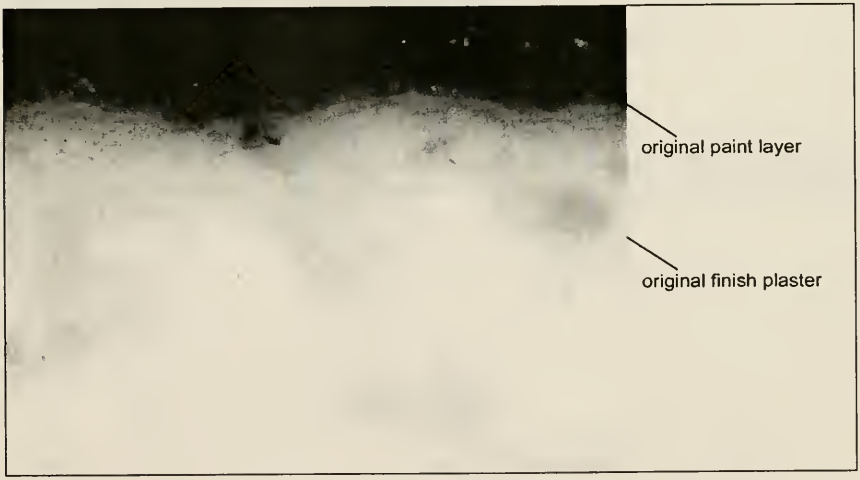


Figure B.33 Cross-sectional photomicrograph of sample 2.06-3 again illustrating the original finish treatment in the upstairs hall. This sample was taken from the stairway between two widows. Magnification 50X.

UPSTAIRS HALL

2.06

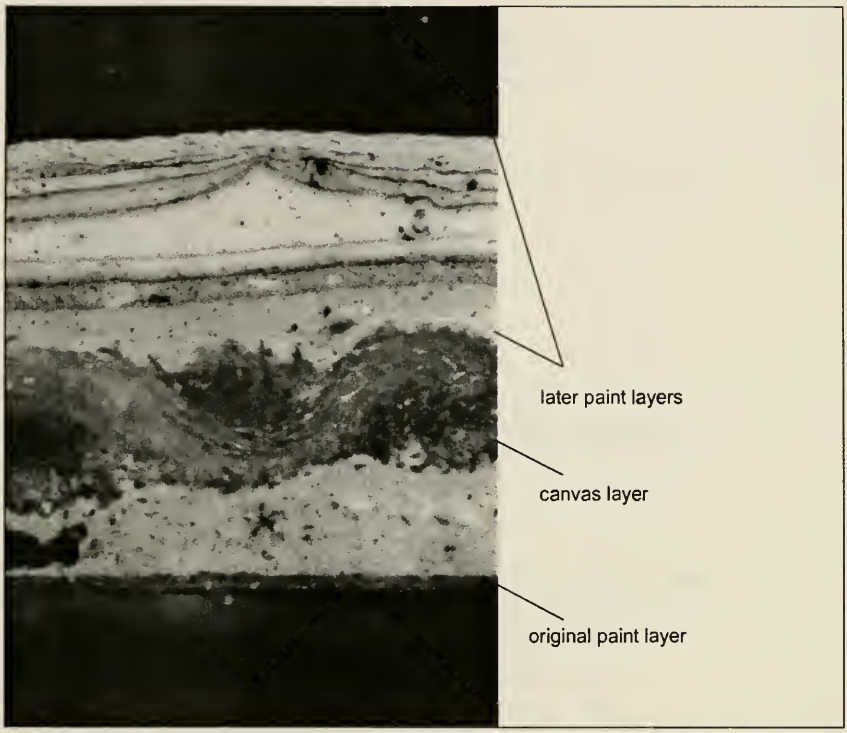


Figure B.34 **Cross-sectional photomicrograph of sample 2.06-3 illustrating the original orange-red paint and subsequent paint and canvas layers in the upstairs hall. Magnification 25X.**

BATHROOM

2.08

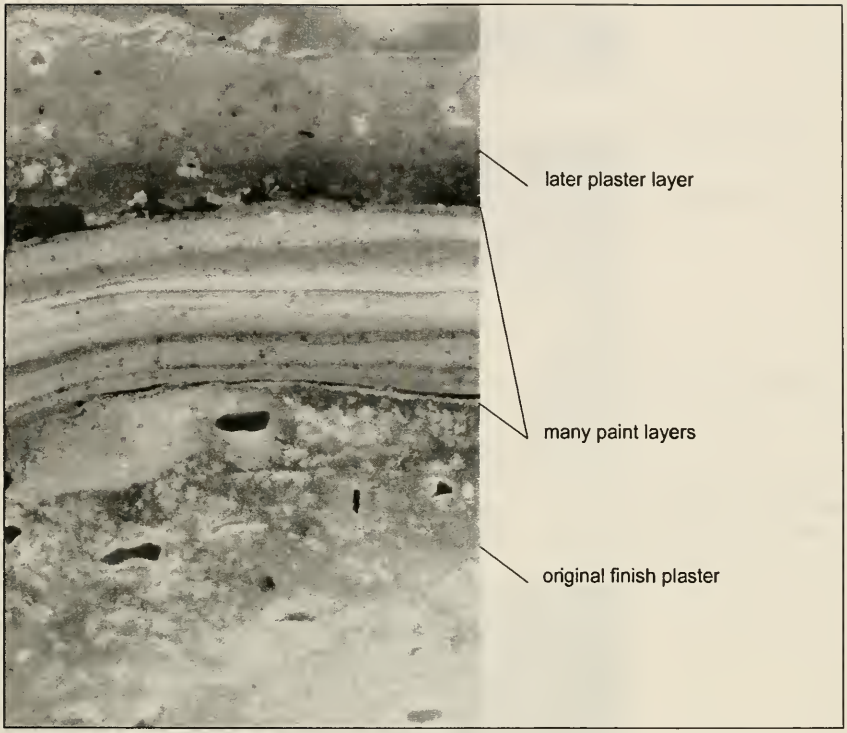


Figure B.35 Cross-sectional photomicrograph of sample 2.08-1 illustrating original finish plaster and early paint layers in the bathroom. The original paint layer is not believed to be present. Magnification 25X.

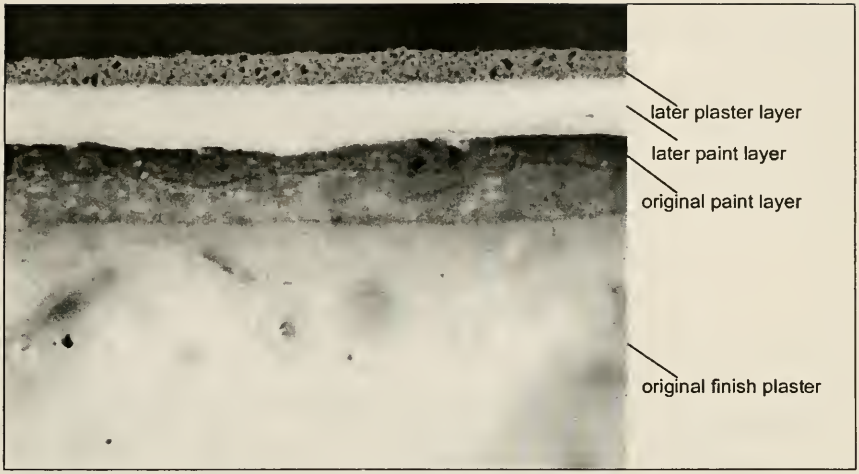


Figure B.36 Cross-sectional photomicrograph of sample 2.09-1 illustrating original orange paint layer and later plaster campaign in this bedroom. Magnification 50X.

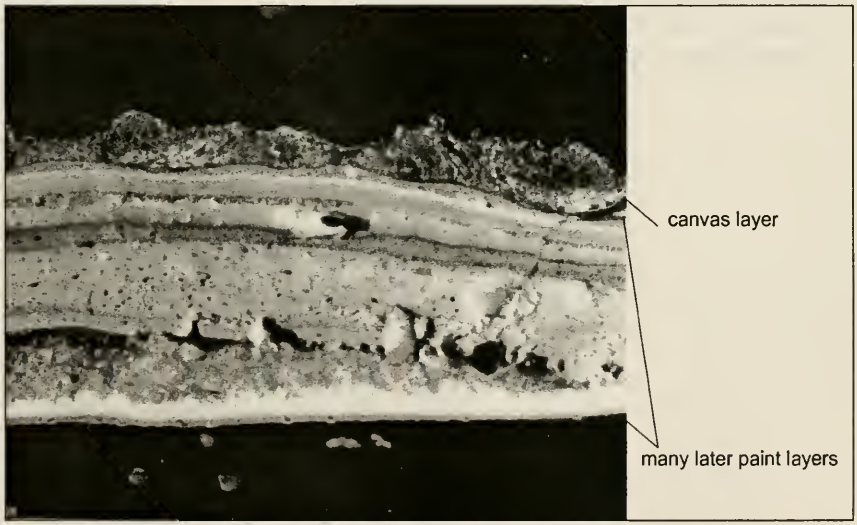
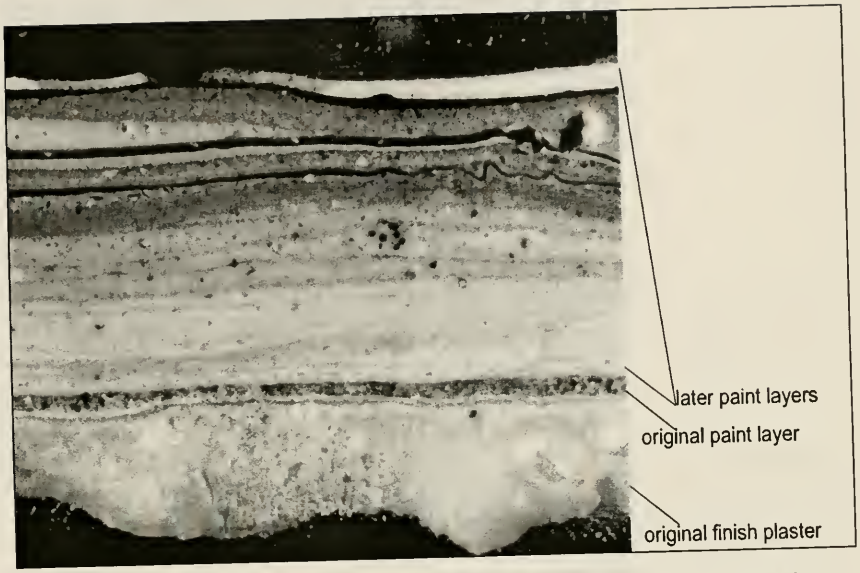


Figure B.37 Cross-sectional photomicrograph of sample 2.09-1 illustrating later paint and canvas layers in this bedroom. Magnification 25X.

CLOSET

2.10



FigureB.38 Cross-sectional photomicrograph of sample 2.10-1 illustrating original plaster and original orange layer and many subsequent paint layers in the closet. Magnification 25X.

SEWING ROOM CLOSET

2.11

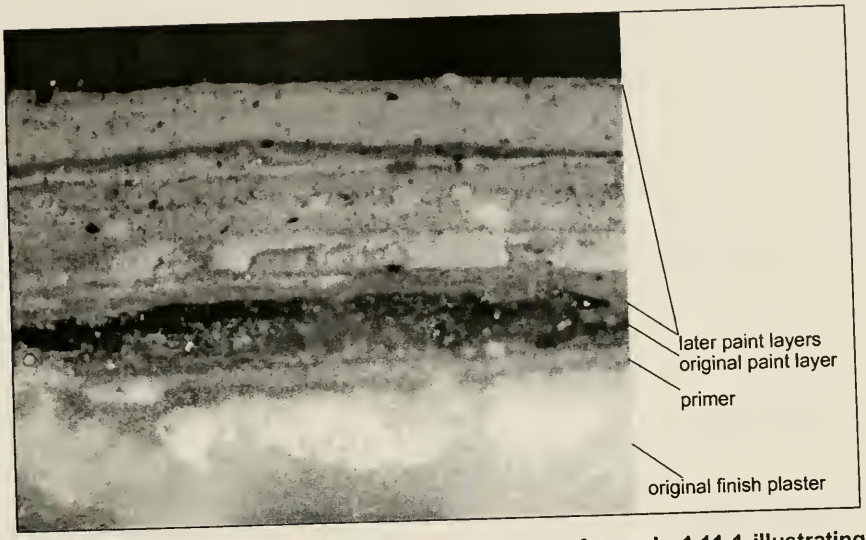


Figure B.39 Cross-sectional photomicrograph of sample 1.11-1 illustrating original plaster and original green and subsequent paint layers. Mag. 25X.

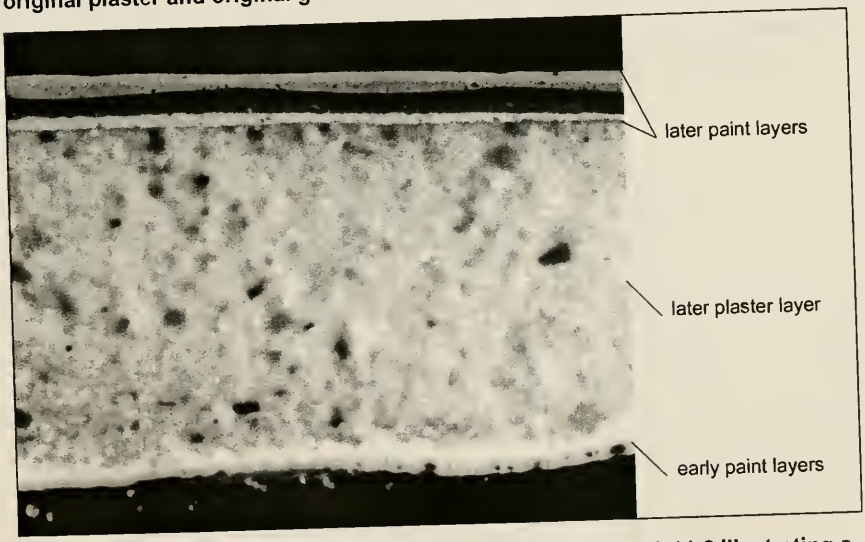


Figure B.40 Cross-sectional photomicrograph of sample 2.11-2 illustrating a later plaster layer and later paint layers in the sewing room closet. Mag. 25X.

SEWING ROOM

2.12

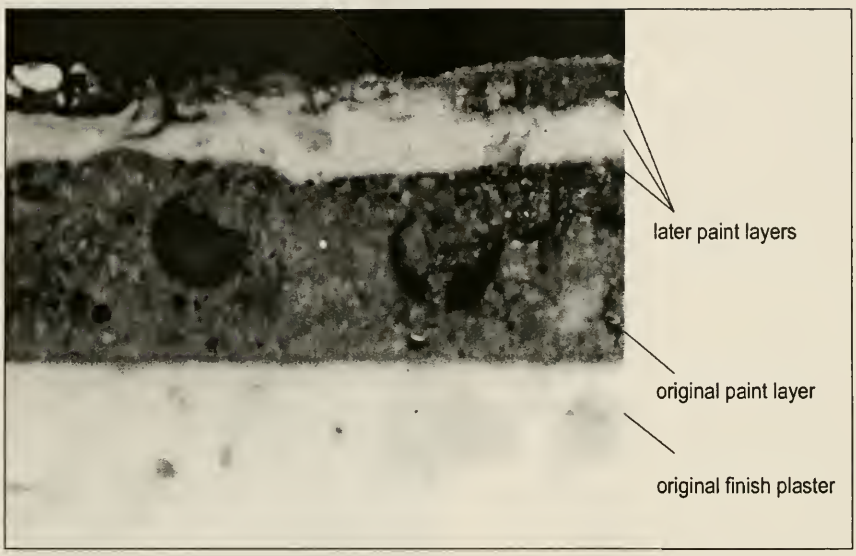


Figure B.41 Cross-sectional photomicrograph of sample 2.12-2 illustrating the original finish plaster and original green paint layer in the sewing room. Magnification 50X.

SEWING ROOM

2.12

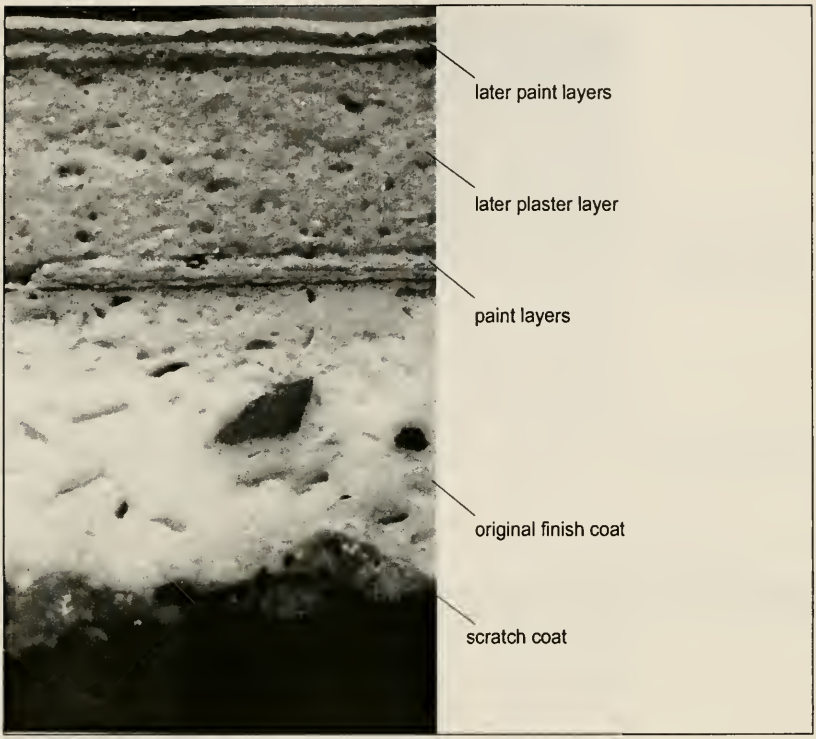


Figure B.42 Cross-sectional photomicrograph of sample 2.12-1 illustrating original and later plaster campaign in the sewing room. Magnification 25X.

HALL CLOSET

2.13

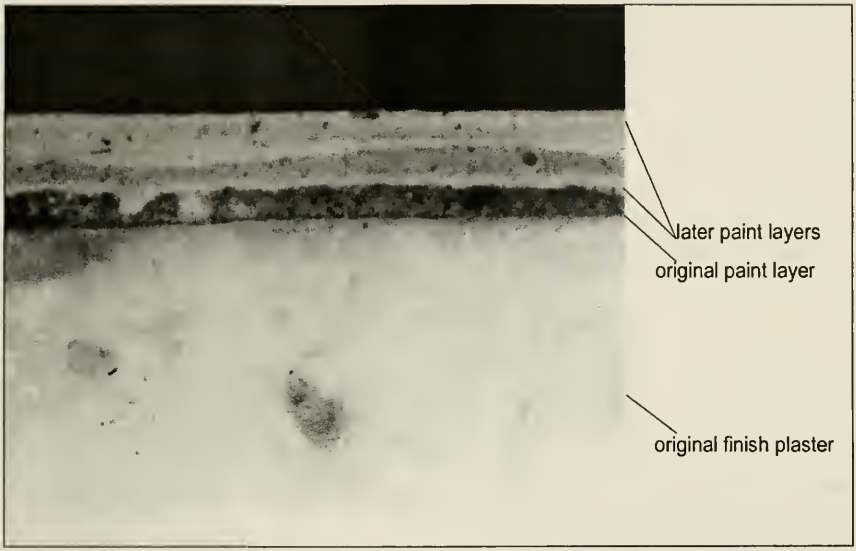


Figure B.43 Cross-sectional photomicrograph of sample 1.13-1 illustrating finish plaster and original green paint layer in the hall closet on the second floor. Magnification 25X.

ATTIC

3.03

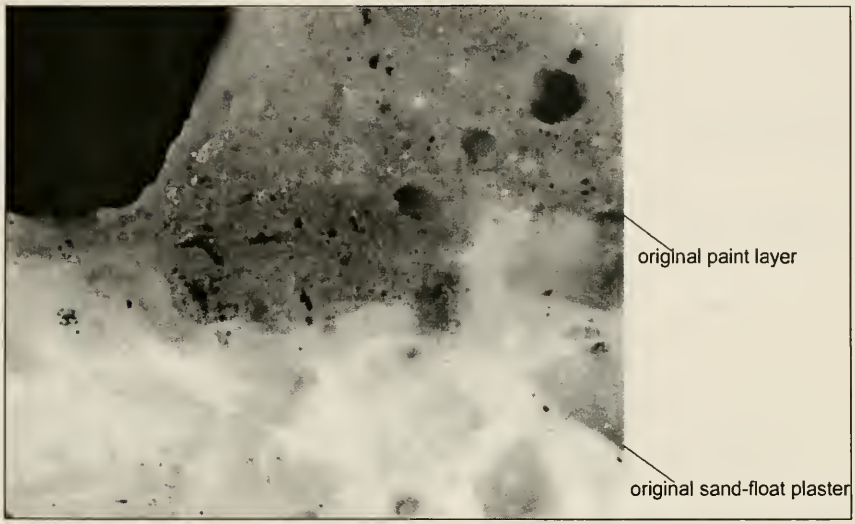


Figure B.44 Cross-sectional photomicrograph of sample 3.03-1 illustrating the sand-float plaster and original paint in the attic. Magnification 50X.

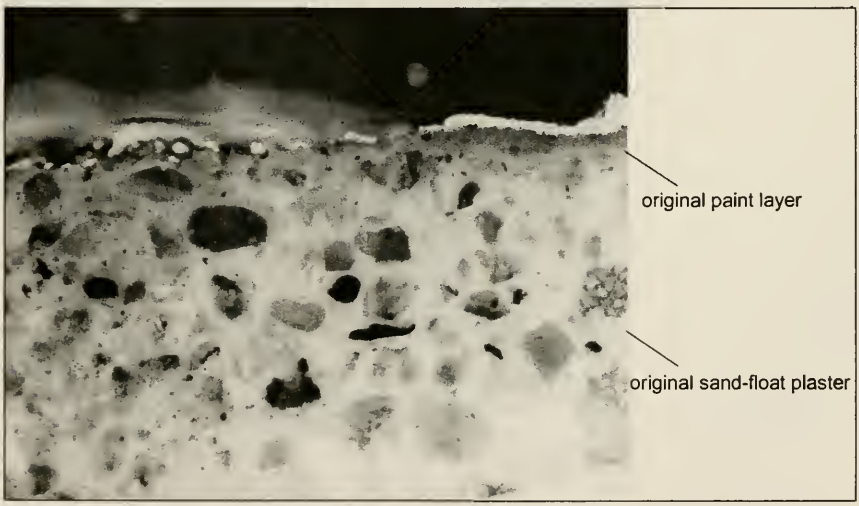


Figure B.45 Cross-sectional photomicrograph of sample 3.03-1 illustrating the original finish in the attic. Magnification 25X.

THIRD FLOOR DINING AREA

3.07

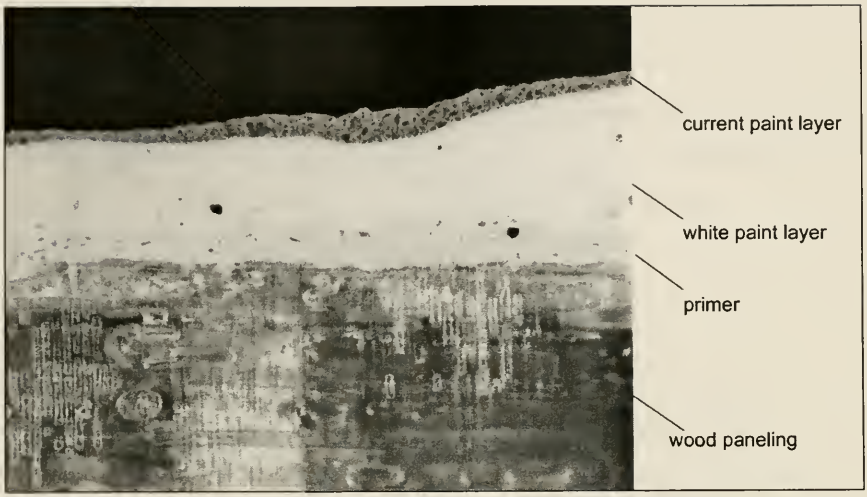


Figure B.46 Cross-sectional photomicrograph of sample 3.07-3 illustrating the recent wood paneling and later paint layers. Magnification 25X.

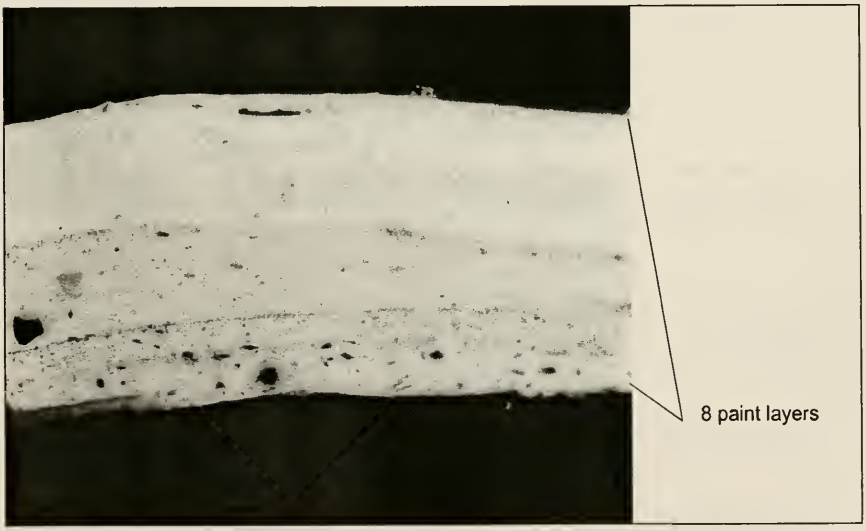


Figure B.47 Cross-sectional photomicrograph of sample 3.07-4 illustrating paint layers on the third floor dining room baseboard. Magnification 50X.

PLAY ROOM

3.08

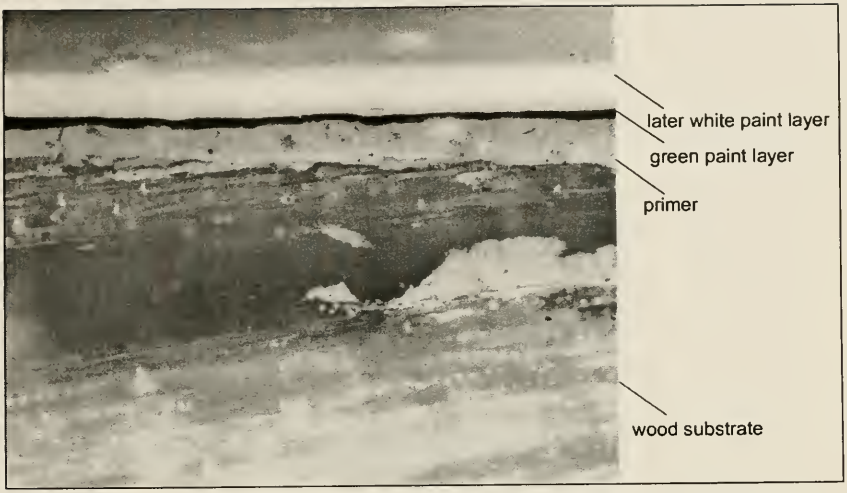


Figure B.48 Cross-sectional photomicrograph of sample 3.08-1 illustrating the interior window and door window finish in the play room, east elevation. Magnification 25X.

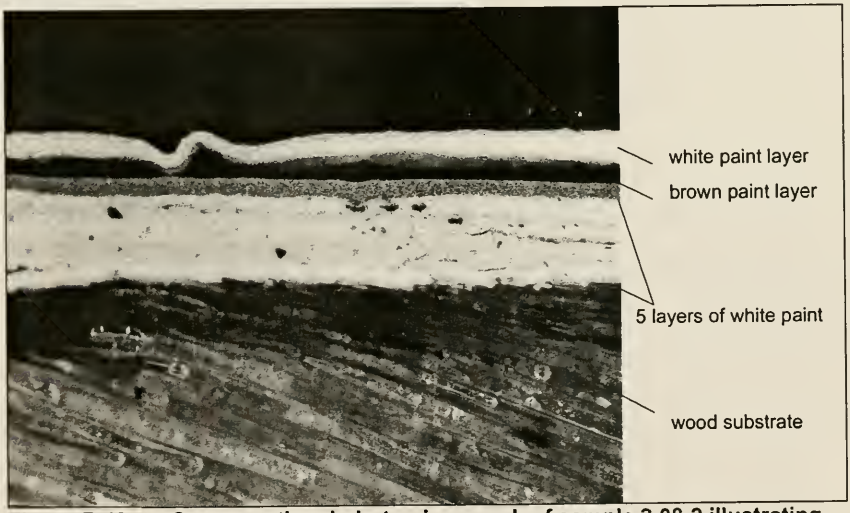


Figure B.49 Cross-sectional photomicrograph of sample 3.08-2 illustrating the paint layers on the ceiling joists in the play room. Magnification 25X.

APPENDIX C

Pigment Dispersions

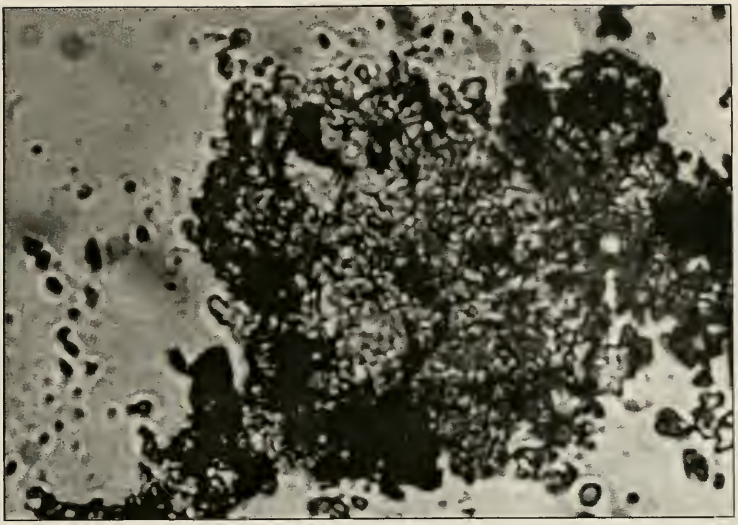


Figure C.1 Photomicrograph of dispersed pigment from sample 1.04-1 (living room). Sample is optically similar to chrome green. Magnification 200X.

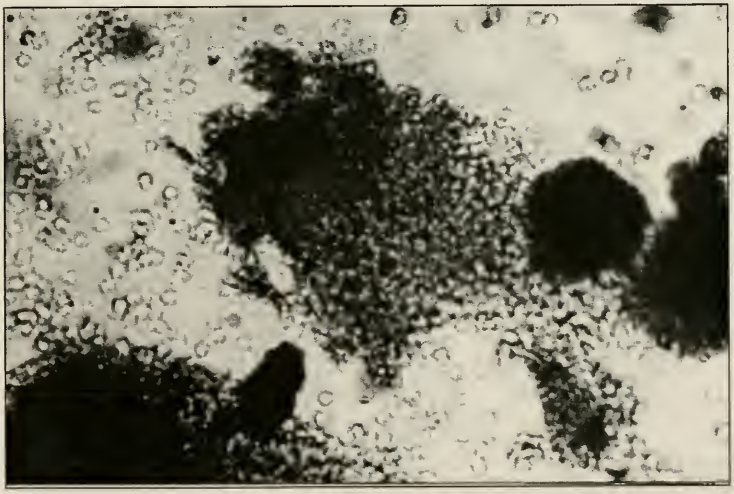


Figure C.2 Photomicrograph of McCrone reference sample of chrome green pigments. Magnification 200X.

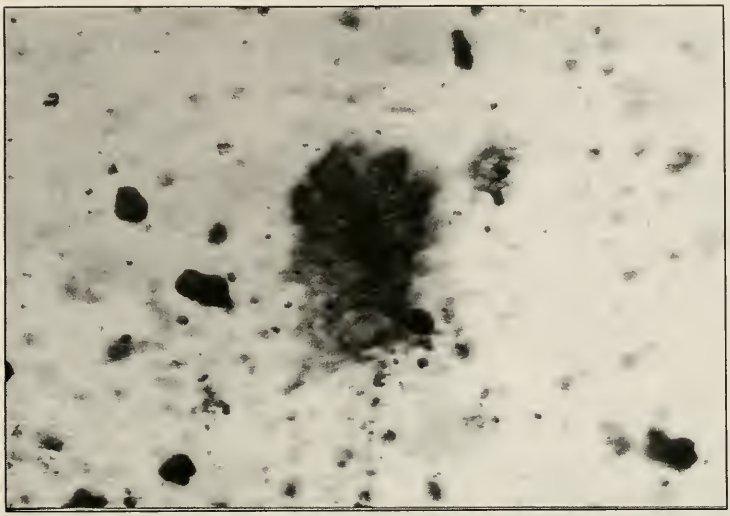


Figure C.3 Photomicrograph of dispersed pigments from the dining room sample 1.12-1. Sample is similar to burnt sienna. Magnification 100X.

Figure C.4 Photomicrograph of McCrone reference sample of burnt sienna pigments. Magnification 100X.

Figure Photomicrograph of particle extracted from metallic layer of sample 1.04-6. (Living room bronzing powder.) Particle is possibly copper. Magnification 100X.

Appendix D

Scanning Electron Microscopy

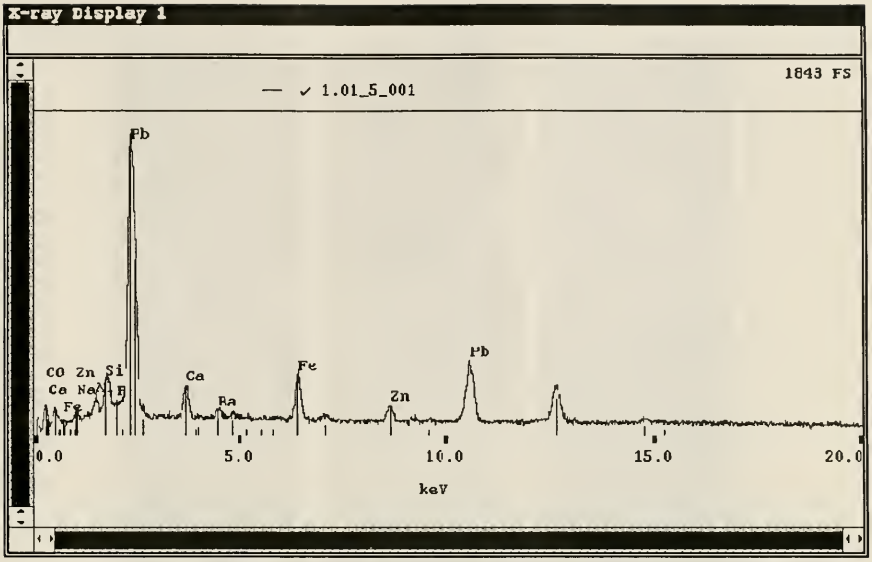


Figure D.1 EDS spectrum for sample 1.01-5 indicating elements present in the vestibule paint layers.

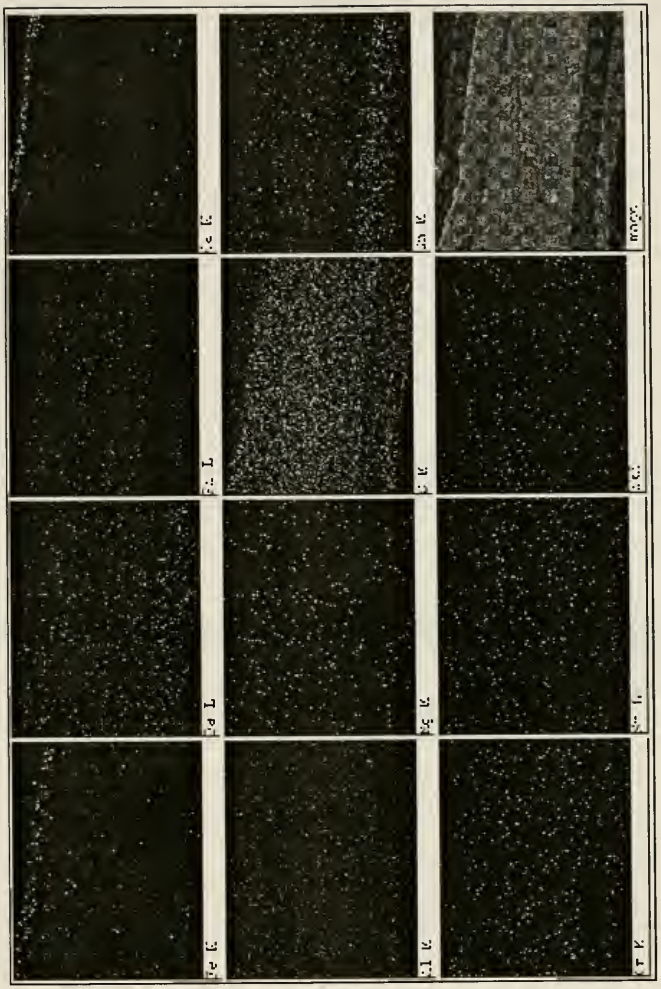


Figure D.2 Electron dot map of sample 1.01-5 indicating the presence of iron in the original brown paint layer in the vestibule. The concentration of blue dots shows the amount of iron in the original paint layer, suggesting the presence of yellow ochre and umber.

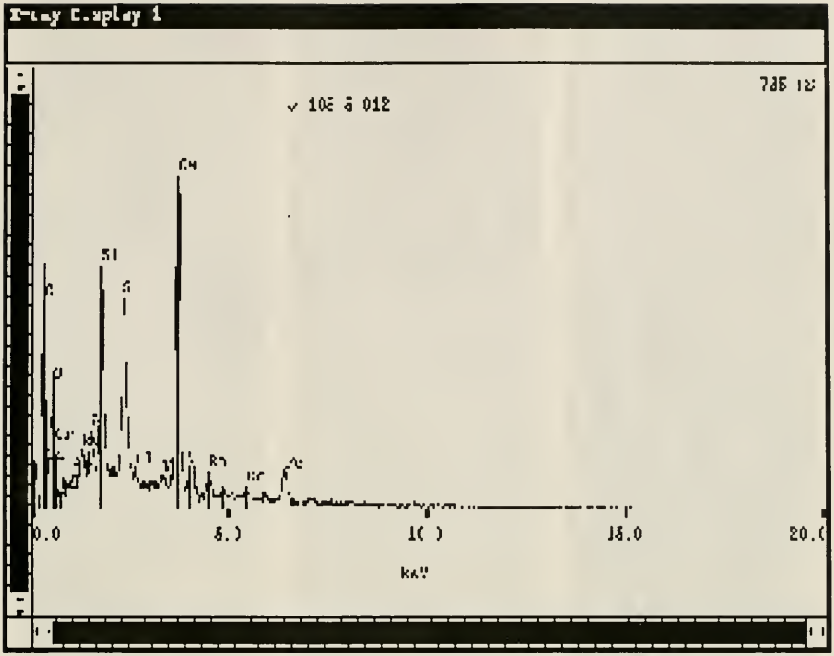


Figure D.3 EDS spectrum of sample 1.03-5 indicating elements present in the original paint layers and the sand-float plaster in the hall.

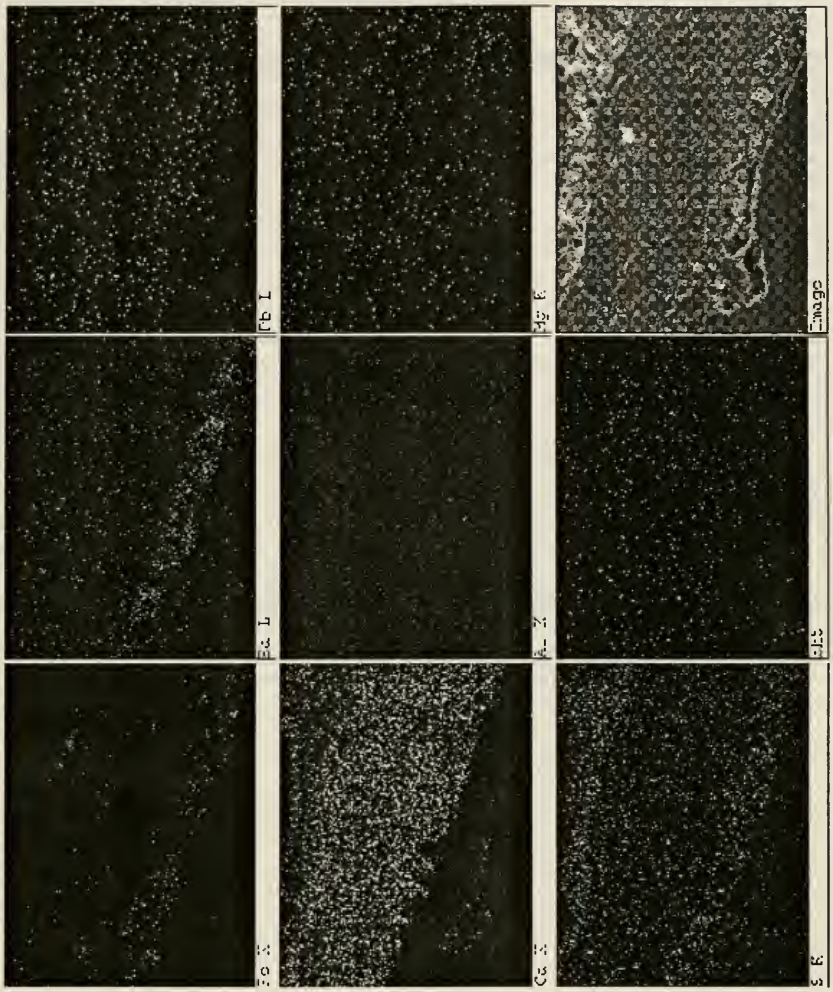


Figure D.4 Electron dot map for sample 1.03-5 indicating concentrations of calcium, barium, and iron in the original paint layers in the hall suggestive of barite, whiting, goethite and yellow ochre. There is a higher concentration of calcium in the hall sample than in the living room.

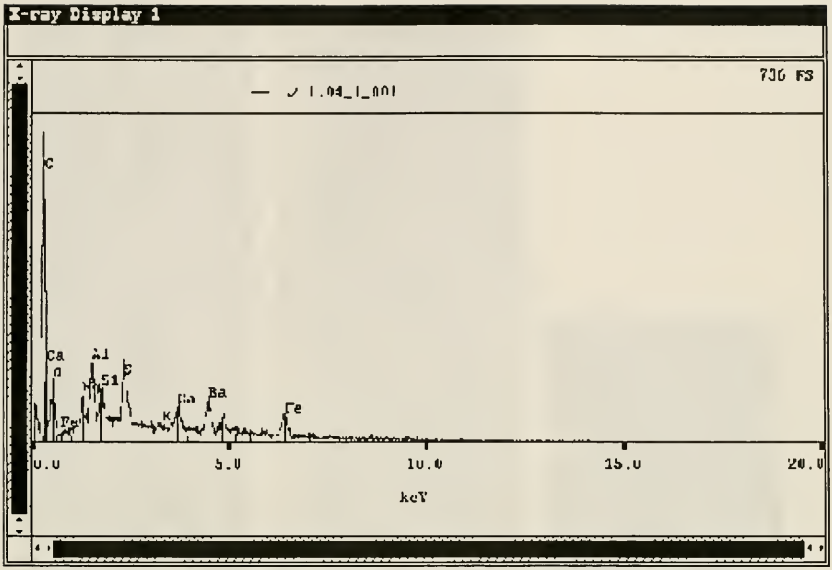


Figure D.5 EDS spectrum for sample 1.04-1 indicating the elements present in the sand-float plaster and original green paint layer in the living room.

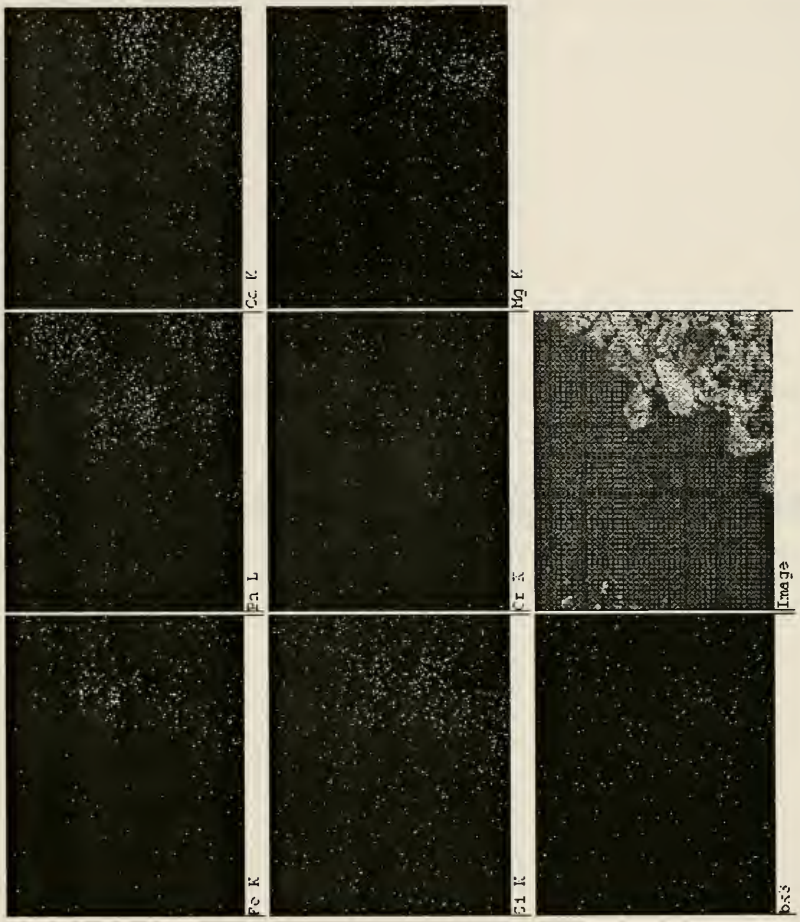


Figure D.6 Electron dot map of sample 1.04-1 indicates the presence of barium and iron in the original paint layer in the living room suggestive of barite, Prussian blue, and yellow ochre. No concentrations of quartz were detected here.

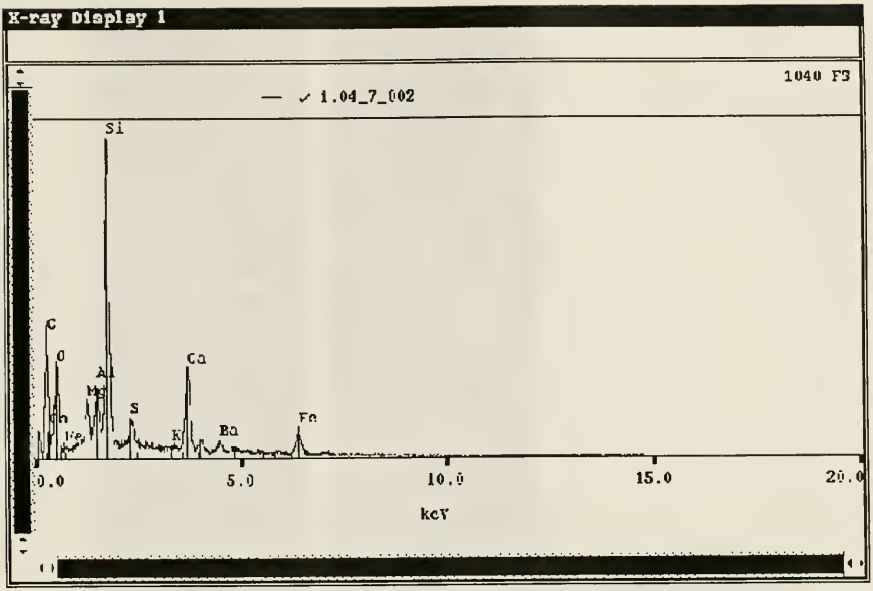


Figure D.7 EDS spectrum for sample 1.04-7 indicating the elements present in the plaster and the decorative ochre paint layer in the living room.

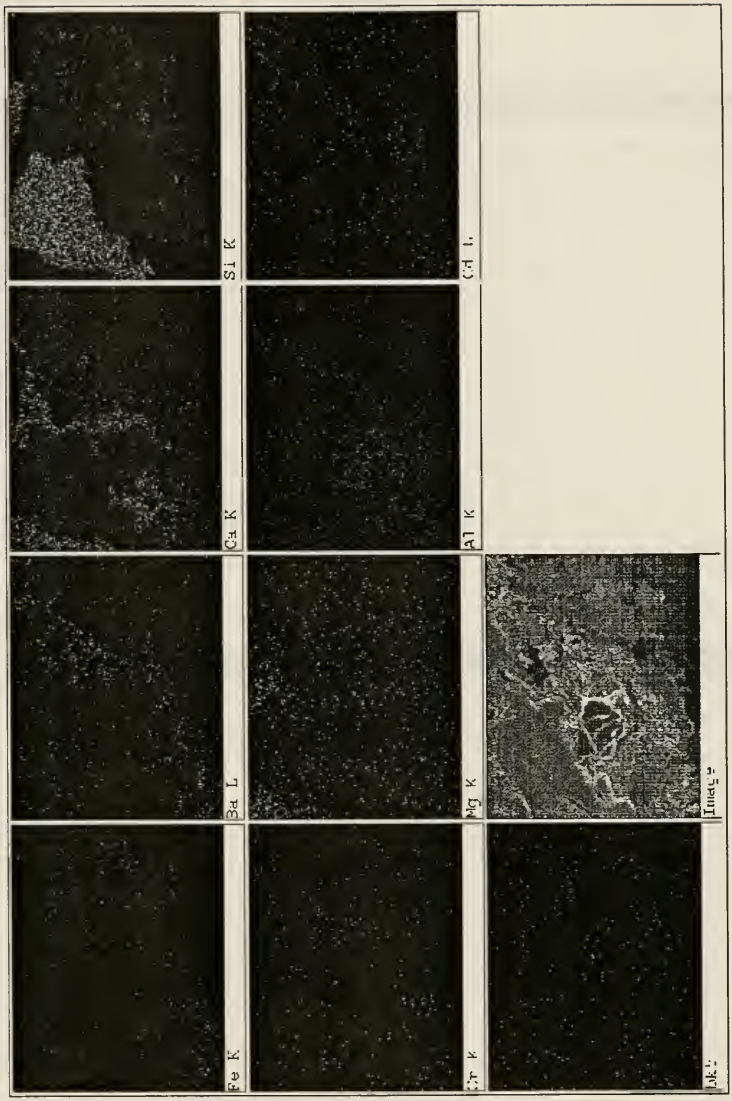


Figure D.8 Electron dot map of sample 1.04-7 indicating the presence of calcium, barium, and iron, suggestive of whiting, barite, and yellow ochre in the original ochre paint layer in the living room.

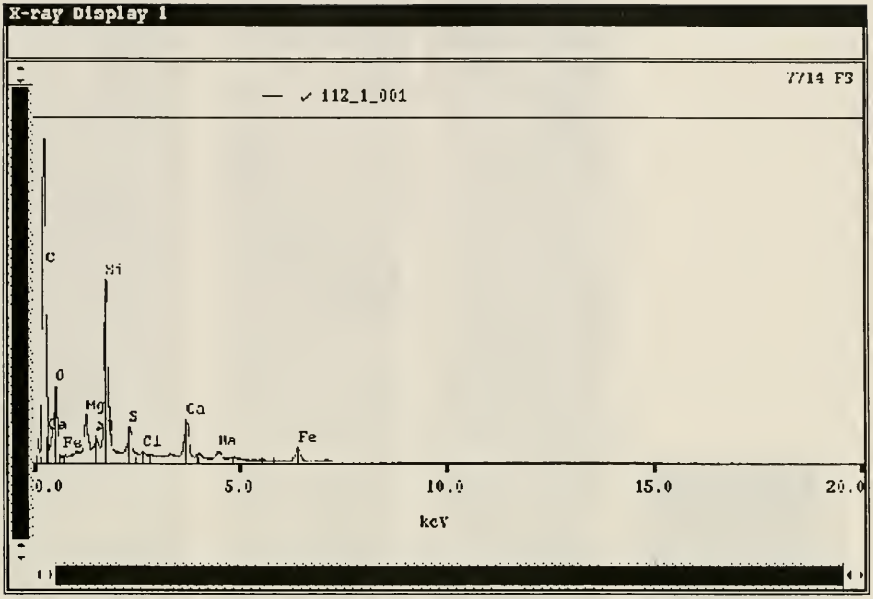


Figure D.9 EDS for sample 1.12-1 indicating the elements present in the original red paint layer in the dining room.

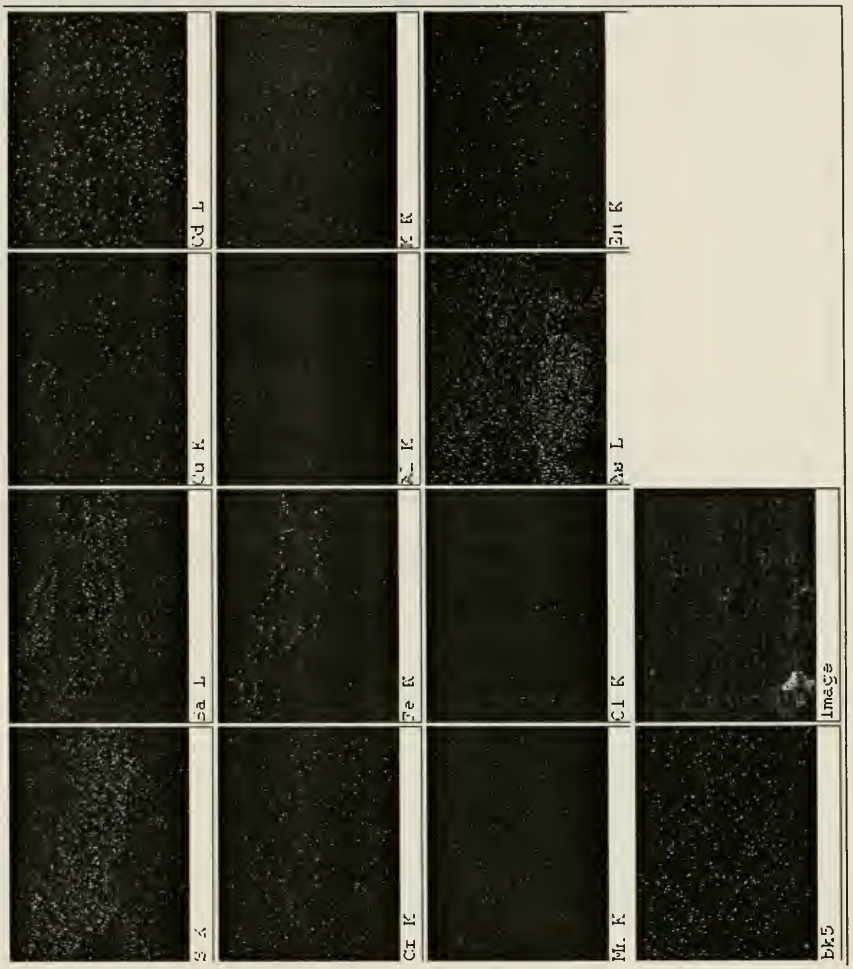


Figure D.10 Electron dot map for sample 1.12-1 indicating the presence of iron and barium in the original red paint layer in the dining room, suggestive of burnt sienna.

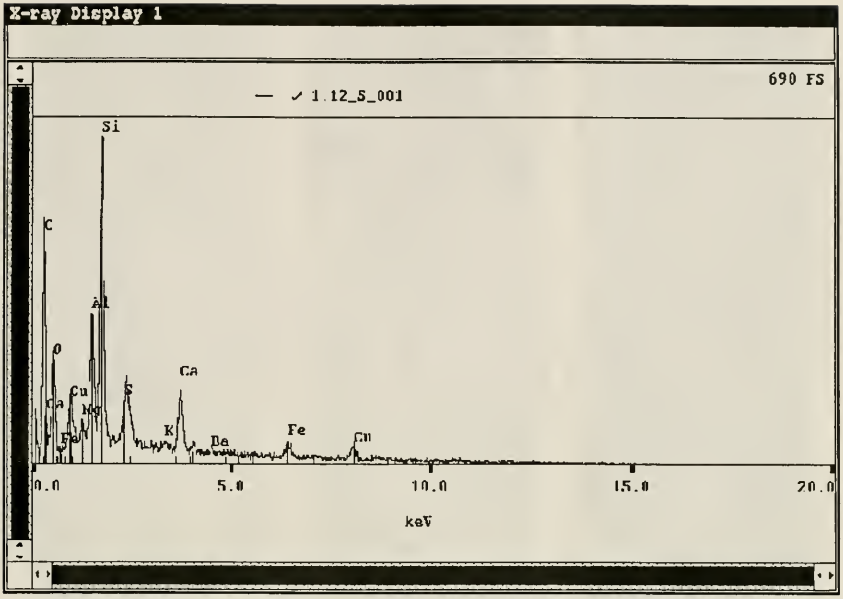


Figure D.11 EDS spectrum for sample 1.12-5 indicating the elements present in the metallic paint layer and the subsequent red paint layer.

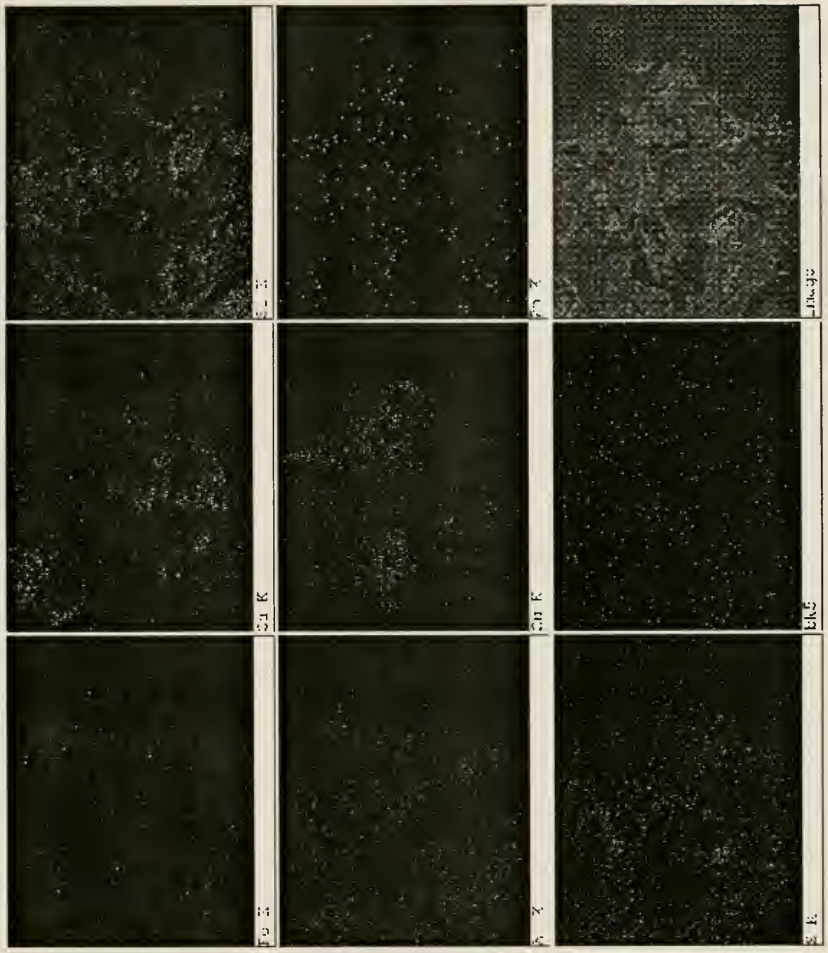


Figure D.12 Electron dot map of sample 1.12-5 indicates the presence of copper and zinc in the bronzing powder and iron in the red paint layer in the dining room. Iron is suggestive of burnt sienna.

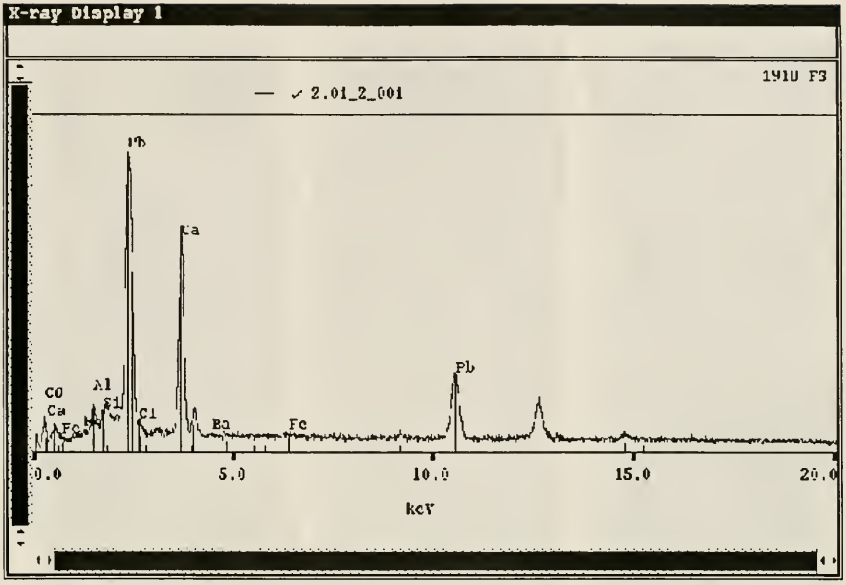


Figure D.13 EDS for sample 2.01-2 indicating elements present in the master bedroom paint layers.

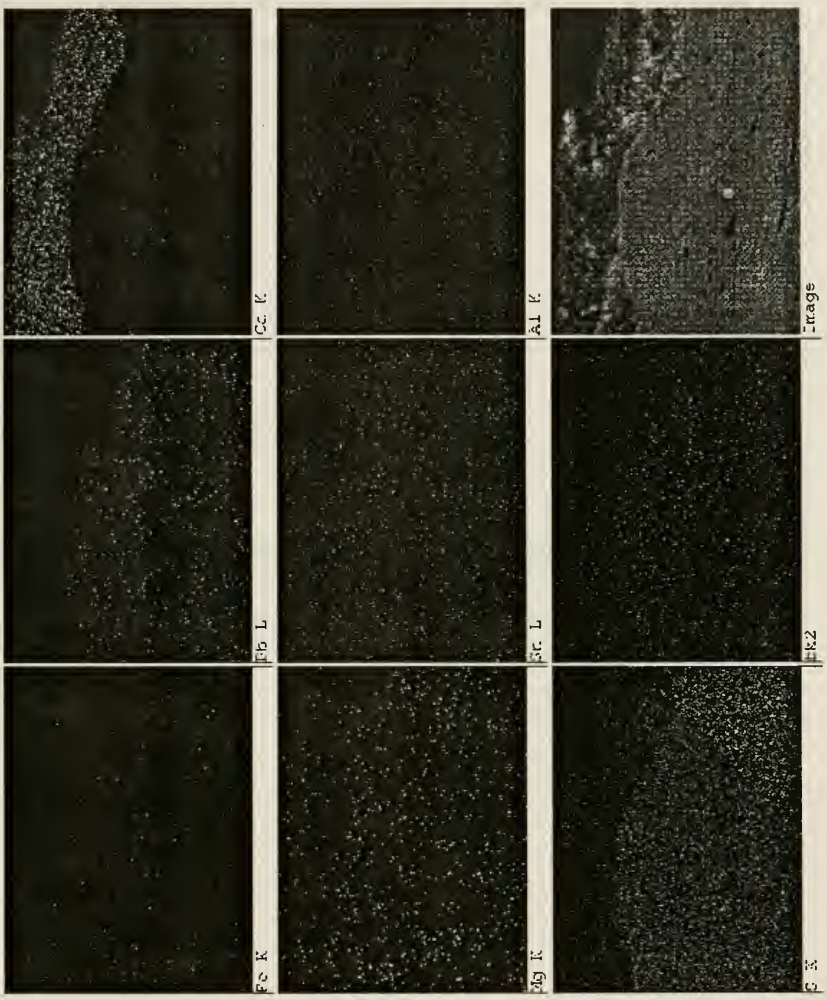


Figure D.14 Electron dot map for sample 2.01-2 indicating the presence of calcium in the original master bedroom paint layer and lead in all later paint layers. No colored pigments were identified in the original layer. The original layer may have whiting as a white colorant. White lead may have been used in many later layers.

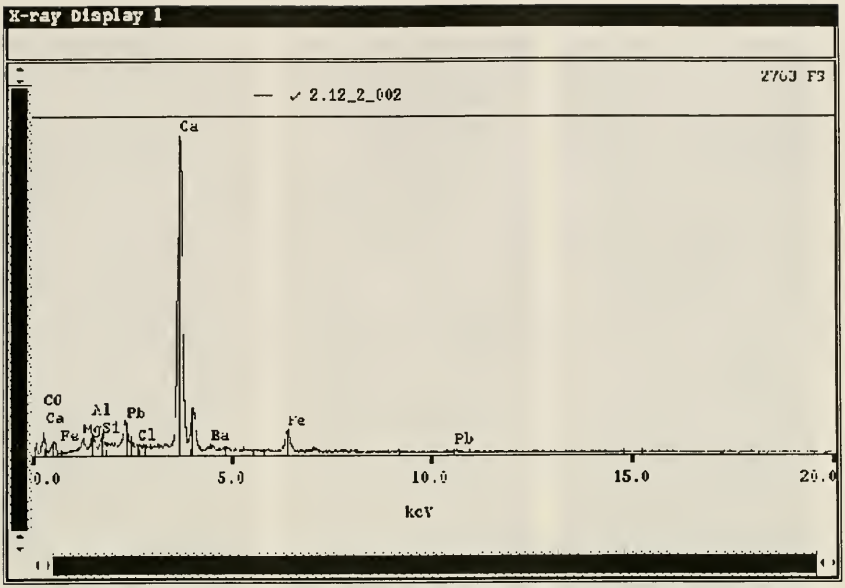


Figure D.15 EDS spectrum for sample 2.12-2 indicating elements present in the original paint layer in the sewing room.

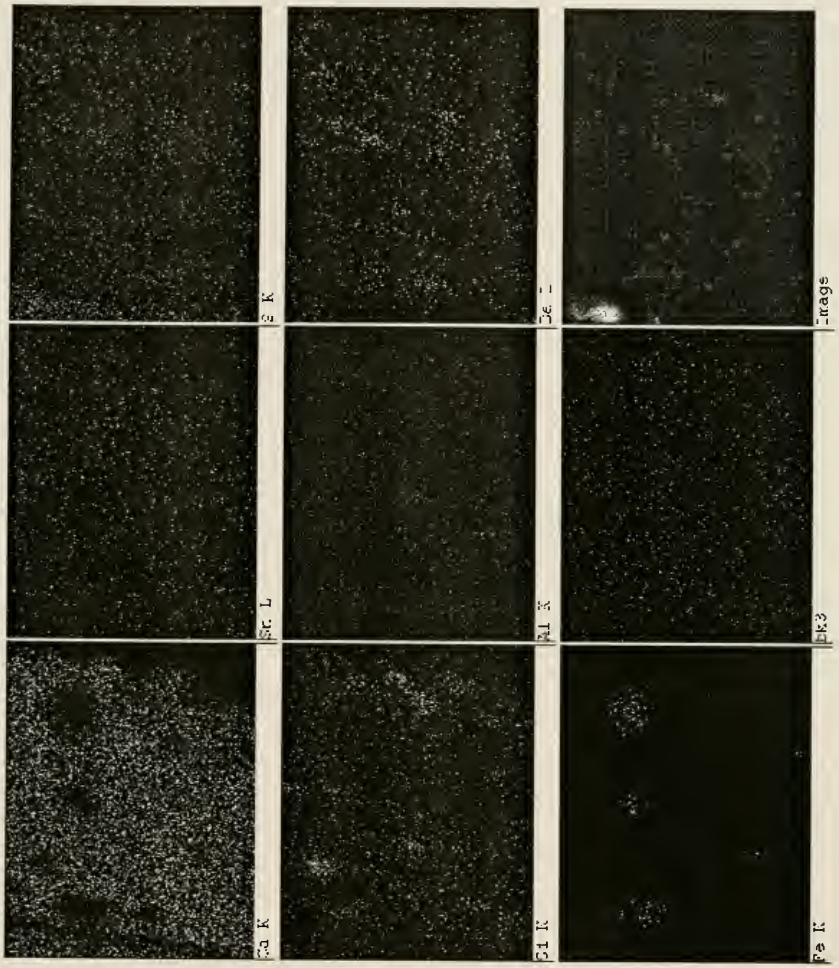


Figure D.16 Electron dot map of sample 2.12-1 indicating concentrations of iron and a great deal of calcium in the original paint layer in the sewing room. This is suggestive of the presence of earth pigments such as yellow ochre and whiting as a white pigment.

APPENDIX E

Stratigraphy Sheets

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.01-1 Room: Vestibule

Sample Location: behind top of mirror, west wall

Sample removed by: F.G. M. Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: builder's paper from construction of wall

Magnification: 25X Mounted or unmounted: unmounted

Sample substrate: paper

Photomicrograph: no Film: Photograph number:

STRATIGRAPHY **COMMENTS**

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Summary: material from addition of wall between 1.01and 1.02

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.01-2 Room: Vestibule

Sample Location: Behind large mirror on west wall

Sample removed by: F. G. M Date of removal: 11/19/99

Sample examined by: Z.W. Date of examination: 1/6/00

Information regarding sample: example of original plaster finish in the house

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 1

STRATIGRAPHY	COMMENTS
1. Rough scratch coat	variety of colors-gray, tan, yellow
2. smooth white plaster	Fine chalky particles, some variation
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: good rep. sample of plaster

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.0-3 Room: Vestibule

Sample Location: above mirror, behind wood rail, west wall

Sample removed by: FGM Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: canvas form after original paint layer

Magnification: _____ Mounted or unmounted: unmounted

Sample substrate: canvas

Photomicrograph: no Film: _____ Photograph number: _____

STRATIGRAPHY	COMMENTS
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.01-4 Room: Vestibule

Sample Location: top of baseboard north wall, east of double door

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: sampled to find original wood finish

Magnification: _____ Mounted or unmounted: unmounted

Sample substrate: wood

Photomicrograph: no Film: _____ Photograph number: _____

STRATIGRAPHY	COMMENTS
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 101-5 Room: Vestibule

Sample Location: inside closet southwest , near baseboard

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: plaster and paint sampled for orig finish

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 3.4

STRATIGRAPHY	COMMENTS
1. PLASTER	
2. YELLOW	PRIMER
3. BROWN	ORIGINAL, YELLOW PIGMENTS EVIDENT
4. TAN	
5. TAN	
6. TAN	
7. TAN	
8. WHITE	
9. BROWN	
10.WHITE	
11.WHITE	
12.LIGHT GREEN	
13.WHITE	
14.	
15.	

Summary: original finish and primer and many later layers

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.01-6 Room: Vestibule

Sample Location: inside closet south side, behind baseboard

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample: sampled for confirm. of original layer

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: _____

	STRATIGRAPHY	COMMENTS
1.	PLASTER	
2.	YELLOW	PRIMER
3.	BROWN	ORIGINAL
4.	TAN	
5.	"	
6.	"	
7.	OFF-WHITE	
8.	"	
9.	"	
10.	TAN	
11.		
12.		
13.		
14.		
15.		

Summary: good sample illustrating original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.02-1 Room: Reception Room

Sample Location: behind switch plate on pillar, north side

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: looking for original protected wood finish

Magnification: 50X Mounted or unmounted: unmounted

Sample substrate: wood

Photomicrograph: no Film: Photograph number:

STRATIGRAPHY	COMMENTS
1. WOOD	
2. SOME RESINOUS MATERIAL	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: no wax evident

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.02-2 Room: Reception Room

Sample Location: window sash above handle (pull), south wall

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: looking for original finish, may have been stripped

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 12,13

STRATIGRAPHY	COMMENTS
1. WOOD	SUBSTRATE
2. YELLOW -WHITE PRIMER	
3. LIGHT GREEN	
4. DARK GREEN	
5. WHITE	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: original finish remains

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.02-3 Room: Reception Room

Sample Location: behind radiator, north wall

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: looking for original finish, hads original canvas,

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: canvas

Photomicrograph: yes Film: Kodak Photograph number: 15

STRATIGRAPHY	COMMENTS
1. CANVAS ROUGH BROWN	
2. MINT GREEN	
3. WHITE	
4. ROUGH WHITE	
5. PINK/RED/CLAY	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: no original paint found

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.02-4 Room: Reception

Sample Location: above entry north wall, near east corner

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample: looking for original finish

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: none

Photomicrograph: yes Film: Fuji 200 Photograph number: 11,12

STRATIGRAPHY	COMMENTS
1. BROWN-ORANGE	
2. TAN	
3. TAN	
4. OFF-WHITE	
5. WHITE	
6. CREAM	
7. SALMON	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: probably original finish present here

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.03-1 Room: Hall

Sample Location: West side of double doors under hardware plate

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/7/00

Information regarding sample: looking for original wood finish

Magnification: 100 Mounted or unmounted: unmounted

Sample substrate: wood

Photomicrograph: none Film: _____ Photograph number: _____

STRATIGRAPHY	COMMENTS
1. WOOD SUBSTRATE	
2. CLEAR LAYER	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.03-2 Room: Hall

Sample Location: east wall, behind baseboard

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: protected drip of orig paint

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: sand-float plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 26, 27

STRATIGRAPHY	COMMENTS
1. SAND-FLOAT PLASTER	TAN, GREY, ORANGE SAND
2. ORANGE PAINT LAYER	YELLOW, RED, BROWN PARTICLES
3. DIRT LAYER	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: good example of original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.03-4 Room: Hall

Sample Location: behind switch plate, south wall, near D.R.

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/6/00

Information regarding sample: looking for gold original

Magnification: 50X Mounted or unmounted: unmounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 17.18

	STRATIGRAPHY	COMMENTS
1.	WHITE	PLASTER
2.	ORANGE	
3.	RED	DIRECTLY OVER RED
4.	CANVAS	
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary: matches dining room red

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.03-5 Room: Hall

Sample Location: behind switch plate, south wall, near dining room

Sample removed by: FGM Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/7/00

Information regarding sample: looking for gold original

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 20 Photograph number: 21,22

STRATIGRAPHY	COMMENTS
1. SAND FLOAT PLASTER	
2. ORANGE	
3. DARK GREEN	
4. CANVAS	
5. MEDIUM GREEN	
6. LIGHT GREEN	
7. DARK GREEN	
8. PEACHY TAN	
9. TAN	
10. LIGHT BROWN	
11. PEACHY TAN	
12. CANVAS	
13. MED. GREEN	
14. OFF-WHITE	
15. GOLD	

Summary: original finish is orange with green over to match living room

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-1 Room: Living room

Sample Location: drop ceiling near southeast corner by light opening

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/8/00

Information regarding sample: original finish existing

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 21,22

	STRATIGRAPHY	COMMENTS
1.	SAND-FLOAT PLASTER	
2.	THIN GREEN LAYER	PIGMENTS VISIBLE ANDREFLECTIVEMATERIAL
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary: original living room finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-2 Room: living room

Sample Location: window sash south side, under pull

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/9/00

Information regarding sample: looking for original sash finish

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 24

STRATIGRAPHY	COMMENTS
1. ____WOOD	
2. TAN-LIGHT YELLOW	PRIMER
3. GREEN	
4. LIGHTER GREEN	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: no evidence of varnish here

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-4 Room: living room

Sample Location: window sash, unprotected ,south wall, second bay from west

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/9/00

Information regarding sample: comparing to protected sample

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak 200 Photograph number: 1,2,

	STRATIGRAPHY	COMMENTS
1.	WOOD	
2.	WHITE	PRIMER
3.	GREEN	
4.	DARK LAYER	
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-5 Room: living room

Sample Location: behind light sconce on wall

Sample removed by: RF Date of removal:

Sample examined by: ZW Date of examination: 1/12/00

Information regarding sample: sample taken by Robert Furhoff

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 4,5

	STRATIGRAPHY	COMMENTS
1.	SAND-FLOAT PLASTER	
2.	GREEN	ORIGINAL FINISH
3.	BROWN CANVAS	
4.	DARK-,MEDIUM GREEN	
5.	MEDIUM GREEN	
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary: original and many later layers

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-6 Room: living room

Sample Location: strip between wood moldings

Sample removed by: RF Date of removal:

Sample examined by: ZW Date of examination: 1/13/00

Information regarding sample: decorative band between strips

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 6,7

	STRATIGRAPHY	COMMENTS
1.	SAND-FLOAT PLASTER	
2.	GOLDEN YELLOW	PRIMER?
3.	GOLD	
4.	MEDIUM GREEN	
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Summary: gold used in this area

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-7 Room: living room

Sample Location: transition between wall corner and ceiling banding

Sample removed by: RF Date of removal:

Sample examined by: ZW Date of examination: 1/12/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 8.9

STRATIGRAPHY	COMMENTS
1. SAND-FLOAT PLASTER	
2. DARK-MEDIUM GREEN	
3. ORANGE/CLAY	SIMILAR TEXTURE AS 2
4. DARK GREEN	
5. CANVAS	
6. LIGHT GREEN	
7. DARK GREEN	
8. TAN-BUFF	
9. THIN LIGHT BROWN	
10. LIGHT TAN	
11. CREAMY WHITE	
12. LIGHT TAN	
13. CREAMY WHITE	
14. LIGHT TAN	
15. CHALKY GREEN	

Summary: orange layer is original

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-8 Room: living room

Sample Location: south bay ceiling

Sample removed by: RF Date of removal:

Sample examined by: ZW Date of examination: 1/13/00

Information regarding sample: original finish

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 11/12

STRATIGRAPHY	COMMENTS
1. SAND PLASTER	COLORFUL
2. MEDIUM GREEN	THIN LAYER, WITH CLEAR SAND
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.04-10 Room: living room

Sample Location: canvas layer over original paint

Sample removed by: RF Date of removal:

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample: canvas sample

Magnification: 50X Mounted or unmounted: unmounted

Sample substrate: canvas

Photomicrograph: no Film: Photograph number:

STRATIGRAPHY	COMMENTS
1. DARK GREEN	
2. WHITE AND BROWN CANVAS	
3. DARK GREEN	
4.LIGHT GREEN	
5. DARK GREEN	
6. BUFF/TAN	
7. LIGHT BROWN	
8. TAN	
9.OFF-WHITE/CREAM	
10.TAN/BUFF	
11.MEDIUM GREEN	CHALKY
12.LIGHT YELLLOW	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-1 Room: porch

Sample Location: window frame, south door sidelight

Sample removed by: FGM Date of removal: 11/20

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak 200 gold Photograph number: 16

STRATIGRAPHY **COMMENTS**

1. WOOD
2. GREEN-YELLOW
3. LIGHT TAN/PEACH
4. LGHT BROWN
5. DIRT
6. LIGHT BROWN
7. DIRT
8. PEACH-TAN
9. DIRT
10. PEACH-TAN
11. DIRT
12. GREY TAN
13. GREY TAN
14. PEACH-CREAM
15. "'

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.06-2 Room: porch

Sample Location: transom panel above door, south side

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: kodak gold 200 Photograph number: 18

STRATIGRAPHY	COMMENTS
1. ROUGH WHITE PLASTER	
2. CREAM-PEACH	
3. 14 LAYERS OF PEACH BROWN	
4.WHITE	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-3 Room: porch

Sample Location: enframement south door

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 11/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 20,21

STRATIGRAPHY	COMMENTS
1. WOOD	
2. TAN	
3. TAN	
4.WHITE	
5. PEACH/TAN	
6. WHITE	VERY THIN
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-4 Room: porch

Sample Location: bottom fascia board below window sill, east wall

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 22

STRATIGRAPHY	COMMENTS
1. WOOD	
2. LIGHT BROWN X4	
3. PEACH-YELLOW	RED PIMENTS
4.LIGHT BROWN	
5. DIRT	
6. BUTTER YELLOW	
7. WHITE	
8. PEACH-YELLOW	
9.WHITE	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-5 Room: porch

Sample Location: transom bead on hinge bottom, frame east

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 23,24

STRATIGRAPHY	COMMENTS
1. WOOD	
2. LIGHT BROWN	NO PRIMER EVIDENT
3. DIRT	
4.LIGHT BROWN	
5. DIRT	
6. LIGHT BROWN	
7. DIRT	
8. LIGHT BROWN	
9.DIRT	
10.TAN	
11.DIRT	
12.TAN	
13.LIGHT BROWN	
14.BUTTER	
15.DIRT, WHITE, YELLOW-PEACH	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-6 Room: porch

Sample Location: fixed casement window frame on east wall

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample: difficult to read separate layers here

Magnification: _____ Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 24,25

STRATIGRAPHY	COMMENTS
1. WOOD	
2. TAN/YELLOW	
3. "	
4."	
5. "	
6. TAN	
7. "	
8. PEACH/YELLOW-TAN	
9. LIGHT BROWN	
10. BUTTER	
11. WHITE	
12. PEACH/YELLOW	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-7 Room: porch

Sample Location: beaded board ceiling , under gypboard over plaster

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 3,4

STRATIGRAPHY	COMMENTS
1. WOOD	
2. YELLOW-TAN	PRIMER
3. TAN-OFF-WHITE	
4."	
5. PEACH-YELLOW	DARKER THAN #2
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: different than other samples

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-8 Room: porch

Sample Location: window stile

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 3,4

STRATIGRAPHY	COMMENTS
1. WOOD	
2. YELLOW-TAN	
3. LIGHT BROWN	
4.DIRT	
5. LIGHT BROWN	
6. DIRT	
7. LIGHT BROWN	
8. DIRT	
9.LIGHT BROWN	
10.DIRT	
11.BUTTER	
12.DIRT	
13.WHITE	
14.YELLOW-PEACH	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-9 Room: porch

Sample Location: screen door stop, porch exterior over door

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: unmounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 5,6

STRATIGRAPHY	COMMENTS
1. WOOD	
2. TAN/OFF WHITE	NO PRIMER
3. TAN	
4.PEACH/OFFWHITE	
5. WHITE	
6. TAN-GREY	
7. DARK GREY	
8. YELLOW TAN	
9. "	
10.BUTTER	
11.PEACH-YELLOW TAN	
12."	
13. BUTTER	
14.WHITE	
15.WHITE, PEACH-YELLOW	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-10 Room: porch

Sample Location: exterior porch original art glass stile

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 7,8

STRATIGRAPHY **COMMENTS**

1. WOOD
2. ORANGE-YELLOW TAN
3. TAN
4. DIRT
5. TAN
6. DIRT
7. TAN
8. DIRT
9. TAN
10. DIRT
11. LIGHT GREY TAN
12. DARK GREY
13. PEACH-YELLOW
14. LIGHT BROWN
15. TAN, WHITE, PEACH-YELLOW

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.06-11 Room: porch

Sample Location: storm casement, exterior

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 9,10

STRATIGRAPHY	COMMENTS
1. WOOD	
2. YELLOW-TAN	
3. LIGHT BROWN	
4. LIGHT BROWN	
5. YELLOW TAN	
6. "	
7. LIGHT BROWN	
8. DIRT	
9. WHITE	
10. YELLOW/PEACH	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.06-12 Room: porch

Sample Location: exterior door frame under screen door stop

Sample removed by: FGM Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/14/00

Information regarding sample:

Magnification: Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 11,12

STRATIGRAPHY	COMMENTS
1. WOOD	
2. YELLOW-TAN	
3. TAN	
4.LIGHT BROWN	
5. LIGHT BROWN	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 1.08-1 Room: servant hall

Sample Location: corner of baseboard and trim next to basement door near elevator

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/15/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 1,2,3

STRATIGRAPHY	**COMMENTS**
1. PLASTER	
2. PRIMER	
3. RED/ORANGE PAINT	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.08-4 Room: servant hall

Sample Location: south wall behind radiator

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/15/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 4,5

STRATIGRAPHY **COMMENTS**

1. YELLOW-TAN
2. CREAM
3. "
4."
5. DIRT
6. CREAM
7. "
8. "
9."
10. DIRT
11.TAN
12. TAN
13. LIGHT PEACH
14. BRIGHT GREEN
15. MINT GREEN, WHITE

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.11-1 Room: pantry

Sample Location: next to kitchen door, behind baseboard west wall

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/20/00

Information regarding sample: new construction

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 6,7

STRATIGRAPHY	COMMENTS
1. PLASTER	MODERN LAYER
2. CANVAS -BROWN	
3. WHITE	
4. PINK/CORAL	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.12-1 Room: dining room

Sample Location: east wall, under switch plate, between hall and dr alcove

Sample removed by: ZW Date of removal: 11/19/99

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: original paint and plaster

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 8,9,

STRATIGRAPHY	COMMENTS
1. SAND-FLOAT PLASTER	
2. DEEP RED LAYER	
3. LIGHT PINK	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.12-4 Room: dining room

Sample Location: window sash closest to pantry west wall

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: looking for original window finish evidence

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Fuji 200 Photograph number: 10,11

STRATIGRAPHY	COMMENTS
1. WOOD	
2. PEIMER	
3. LIGHT GREEN	
4.DARK GREEN	
5. BLACK	VARNISH?
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.12-5 Room: dining room

Sample Location: alcove, between two wood strips south wall

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: metallic layer

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Fuji 200 Photograph number: 12,13

STRATIGRAPHY	COMMENTS
1. ROUGH SAND-FLOAT PLASTR	
2. YELLOW	PRIMER
3. GOLD	
4. RED VERY DARK	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: evidence of decorative scheme

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.13-1 Room: telephone room

Sample Location: north and east wall

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: whole history

Magnification: 50X Mounted or unmounted:

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 14,15

STRATIGRAPHY	COMMENTS
1. SCRATCH COAT	
2. WHITE SMOOTH FINSH PLASTER	
3. LIGHT PINK	
4. OFF WHITE	
5. LIGHT PEACH	
6. CANVAS	
7. LIGHT PEACH	
8. GREY TAN	
9. BEIGE	
10. "	
11. "	
12. OFF-WHITE	
13.TAN	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.14-1 Room: back hall

Sample Location: exterior side(east) bathroom door, behind hardware

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: looking for original wood finish

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Fuji 200 Photograph number: 18,19

STRATIGRAPHY **COMMENTS**

1. WOOD
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.14-2 Room: back hall

Sample Location: north wall next to elevator and porch behind baseboard

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/17/00

Information regarding: sample:possible elevator date finishes

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 10,11

STRATIGRAPHY	COMMENTS
1. WHITE PLASTER	TRANSLUCENT
2. TAN-PEACH	
3. DIRT	
4. TAN-PEACH	
5. DIRT	
6. TAN-PEACH	
7. CREAM	THICK
8. BRIGHT GREEN	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.14-3 Room: back hall

Sample Location: south wall above glass window

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample: looking for original back hall finish

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 19,20

STRATIGRAPHY	COMMENTS
1. ROUGH PLASTER	
2. ORANGE-BROWN-RED	
3. OFF-WHITE	
4. WHITE	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.14-4 Room: back hall

Sample Location: above elevator, north wall

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 1,2,3

STRATIGRAPHY	**COMMENTS**
1. WHITE PLASTER	
2. LIGHT YELLOW	
3. PEACH	
4. WHITE	
5. DIRT	
6. OFF WHITE	
7. LIGHT PEACH	
8. OFF WHITE	
9. WHITE	
10. YELLOW-GOLDEN	
11. WHITE	
12. BRIGHT GREEN	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 1.15-1 Room: bathroom

Sample Location: north wall by stair under rail

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 3, 4

STRATIGRAPHY	COMMENTS
1. PEACH	
2. WHITE	
3. LIGHT PEACH	
4. DIRT	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.01-1 Room: master bedroom

Sample Location: exterior window stile sample, south wall

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/15/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Fuji 200 Photograph number: 17, 18

STRATIGRAPHY **COMMENTS**

1. WOOD
2. TAN
3. DIRT
4. YELLOW-TAN
5. DIRT
6. PEACH TAN
7. CREAM-OFF WHITE
8. YELLOW TAN
9. CREAM TAN
10. DARK GREEN
11.
12.
13.
14.
15.

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.01-2 Room: master bedroom

Sample Location: east wall south east corner by baseboard

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/16/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 19,20, 21

STRATIGRAPHY	COMMENTS
1. PLASTER	
2. GREEN BLUE	SHINY
3. LIGHT BLUE	
4. BLUE/AZURE	
5. MANY LAYERS	
6. TAN	
7. "	
8. "	
9. "	
10. "	
11."	
12.WHITE	
13.LIGHT BLUE	
14.BRIGHT BLUE	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.04-1 Room: bedroom

Sample Location: south wall, east of radiator

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 22,23

STRATIGRAPHY **COMMENTS**

1. WHITE PLASTER
2. LIGHT PEACH
3. LIGHTER PEACH
4. BROWN-RED
5. PINK
6. TAN
7. "
8. "
9. CREAM-PEACH
10. "
11. LIGHT GREY
12. DARK RED
13. LIGHT YELLOW
14. CANVAS
15. WHITE , BLUE -GREEN GREY (PRESENT)

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.05-1 Room: bedroom

Sample Location: north wall, cracked plaster

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/16/00

Information regarding sample: has different thin plaster layer

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 24, 1, 2

STRATIGRAPHY **COMMENTS**

1. WHITE PLASTER
2. THIN YELLOW
3. YELLOW-WHITE
4. PEACH WHITE
5. CORAL PINK
6. MILKY PINK
7. CORAL PINK
8. LIGHT PEACH
9. LIGHT PINK
10. LIGHT PEACH
11. CORAL PINK
12. TAN-YELLOW
13. "
14. TAN-GREY
15. LIGHT TAN, " , OFF-WHITE, LIGHT TAN, LIGHT PEACH, " , OFF-WHITE, ", ",
    WHITE, LIGHT YELLOW, WHITE LIGHT YELLOW, LIGHT GREY

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.05-2 Room: bedroom

Sample Location: window, exterior sash, south wall

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/17/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 3,4

STRATIGRAPHY	COMMENTS
1. WOOD	
2. LIGHT CORAL PEACH	
3. DIRT	
4. OFF WHITE	
5. DIRT	
6. PEACH WHITE	
7. DIRT	
8. GREY-WHITE	
9.ORANGE-LIGHT BROWN	
10.WHITE	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.05-3 Room: bedroom

Sample Location: wall field, cracked plaster ,east wall

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/17/00

Information regarding sample:

Magnification: 25 Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: KODAK GOLD 200 Photograph number: 5,6

STRATIGRAPHY **COMMENTS**

1. WHITE PLASTER
2. PEACH
3. LIGHT PEACH
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.05-4 Room: BEDROOM

Sample Location: west wall, above baseboard, where sep. occurs

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/16/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 19,20

STRATIGRAPHY	COMMENTS
1. PLASTER	
2. CORAL-RED	
3. LIGHTER CORAL RED	THICKER
4.OFF WHITE	
5. LIGHT PEACH	
6. PINK	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.06-1 Room: hall

Sample Location: west wall, next to room 2.09, behind peeled canvas, above baseboard

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/17/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 5,6

STRATIGRAPHY	COMMENTS
1. ROUGH PLASTER	
2. SMOOTH WHITE TRANSLUCENT PLASTER	
3. CORAL RED	
4.LIGHT CORAL	
5. OFF WHITE	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary: plaster treatment changes form downstairs hall

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.06-2 Room: Hall

Sample Location: baseboard, west wall

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/17/00

Information regarding sample: confirming original hall finish

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: finish plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 11,12,13

STRATIGRAPHY	**COMMENTS**
1. PLASTER	
2. RED-CORAL	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.06-3 Room: hall

Sample Location: between windows in stairway where canvas is peeled

Sample removed by: ZW Date of removal: 3/11/00

Sample examined by: ZW Date of examination: 3/17/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: fuji 200 Photograph number: 3,4,5

STRATIGRAPHY	COMMENTS
1. PLASTER	
2. ORANGE	RED BLACK YELLOW PIGMENTS
3. OFF WHITE TAN PEACH	
4.CANVAS	
5. OFF WHITE-TAN PEACH	
6. LIGHT TAN PEACH	
7. LIGHT GREY	
8. OFF WHITE	
9. "	
10."	
11. "	
12.LIGHT BLUE	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.08-1 Room: bathroom

Sample Location: north wall, where canvas was removed

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/17/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: PLASTER

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 5,6,7

STRATIGRAPHY **COMMENTS**

1. OFF WHITE PLASTER
2. LIGHT GREEN-BLUE
3. LIGHT BLUE
4. TAN
5. LIGHT PEACH
6. TAN
7. YELLOW-TAN
8. "
9. OFF WHITE
10. "
11. "
12. "
13. LIGHT BLUE
14. OFF WHITE
15. " , LIGHT BLUE GREY

Summary: Sample is obscured, different in many areas

HELLER HOUSE

Interior Finishes Analysis Sample Sheet

Architectural Conservation Laboratory

University of Pennsylvania

Sample Number: 2.09-1 Room: bedroom

Sample Location: south wall, by baseboard, northeast corner

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Fuji 200 Photograph number: 15,16

STRATIGRAPHY	COMMENTS
1. PLASTER	
2. TRANSLUCENT GRAY	
3. YELLOW-ORANGE	
4.WHITE	
5. OFF WHITE	
6. GRAY	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 210-1 Room: dressing room

Sample Location: above rail, next to built in, west wall

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/17/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak 200 Photograph number: 23,24

STRATIGRAPHY	COMMENTS
1. WHITE/OFF WHITE PLASTER	
2. OFF WHITE	THIN
3. PEACH TAN	RED PIGMENTS ORIGINAL?
4. WHITE	
5. YELLOW	
6. WHITE	
7. CREAM	
8. "	
9."	
10. "	
11. "	
12. TAN	
13.LIGHT GRAY	
14. LIGHT GRAY	
15. CREAM PEACH, CREAM, ", " , " , LIGHT GREEN, BRIGHT GREEN, WHITE	

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.11-2 Room: closet

Sample Location: east wall above first rail

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 1,2,3

STRATIGRAPHY	COMMENTS
1. OFF-WHITE PLASTER	
2. MOSS GREEN	
3. LIGHT GREEN	
4. "	
5. "	
6. LIGHT BLUE	
7. TAN-PINK	
8. TAN-YELLOW	
9. OFF WHITE	
10. TAN-LIGHT BROWN	
11. TAN PEACH	
12. WHITE	
13.WHITE PLASTER	MODERN
14. WHITE	
15. AZURE BLUE, DARK BLUE, MINT GREEN, BUTTER YELLOW	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.12-1 Room: sewing room

Sample Location: south wall above baseboard

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/19/00

Information regarding sample:

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 3,4,5

STRATIGRAPHY **COMMENTS**

1. ROUGH PLASTER
2. SMOOTH OFF WHITE PLASTER
3. LIGHT BLUE
4. LIGHT GREEN
5. GRAY WHITE PLASTER
6. WHITE
7. LIGHT MEDIUM GREEN
8. OFF WHITE
9.
10.
11.
12.
13.
14.
15.

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 2.13.-1 Room: closet

Sample Location: north wall

Sample removed by: ZW Date of removal: 11/19/00

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 6,7

STRATIGRAPHY	**COMMENTS**
1. OFF WHITE PLASTER	SOME SAND AND VOIDS
2. LIGHT BLUE	LARGE BLUE PIMENTS
3. OFF WHITE	
4.LIGHT ORANGE-TANGERINE	
5. OFF WHITE	
6. LIGHT TAN-PEACH	
7. OFF WHITE	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.03-1 Room: ATTIC HALL

Sample Location: above stair, under window frame

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/20/00

Information regarding sample: original finish

Magnification: 25X Mounted or unmounted: mounted

Sample substrate: plaster

Photomicrograph: 25X Film: Kodak gold 200 Photograph number: 13,14

STRATIGRAPHY **COMMENTS**

1. ROUGH SAND-FINISHED PLASTER
2. MEDIUM GREEN WITH MORE TARANSPARENT GREEN ABOVE
3. CHALKY WHITE-GREEN
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Summary: original finish

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.07-1 Room: 3rd floor dining room

Sample Location: beaded board inside cabinet, north wall

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/20/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 15,16

STRATIGRAPHY	**COMMENTS**
1. WOOD	
2. OFF-WHITE	
3. WHITE	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.07-3 Room: 3rd floor dining room

Sample Location: wall field west wall, by baseboard

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/20/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 17,18

STRATIGRAPHY	COMMENTS
1. WOOD	
2. YELLOW-TAN	
3. WHITE	
4.OFF WHITE	
5. BRIGHT CORAL PINK	CURRENT COLOR
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.07-4 Room: 3rd floor dining room

Sample Location: baseboard on south side

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 19,20

STRATIGRAPHY

1. WOOD
2. YELLOW-TAN
3. LIGHT TAN
4. DIRT
5. CREAMY WHITE
6. LIGHT GREEEN
7. LIGHT PEACH
8. WHITE
9. WHITE
10. WHITE
11.
12.
13.
14.
15.

COMMENTS

SOME ORANGE PIGMENTS

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.08-1 Room: play room 3rd floor

Sample Location: east wall, wood trim around window

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 50X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: kodak gold 200 Photograph number: 21,22,23

STRATIGRAPHY	COMMENTS
1. WOOD	SUBSTRATE
2. YELLOW-TAN	PRIMER
3. DARK GREEN	
4. WHITE	
5. OFF-WHITE	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

Summary:

HELLER HOUSE

Interior Finishes Analysis Sample Sheet
Architectural Conservation Laboratory
University of Pennsylvania

Sample Number: 3.08-2 Room: play room, 3rd floor

Sample Location: ceiling joist south end, western joist

Sample removed by: ZW Date of removal: 11/20/99

Sample examined by: ZW Date of examination: 1/18/00

Information regarding sample:

Magnification: 50 X Mounted or unmounted: mounted

Sample substrate: wood

Photomicrograph: yes Film: Kodak gold 200 Photograph number: 23,24

STRATIGRAPHY	COMMENTS
1. WOOD	
2. OFF WHITE	
3. LIGHT TAN	
4. OFF WHITE	
5. LIGHT TAN	
6. OFF WHITE	
7. DARK BROWN	
8. WHITE	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

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